News
NASA LEWIS RESEARCH CENTER

21000 BROOKPARK ROAD CLEVELAND, OHIO 44135
PUBLIC INFORMATION OFFICE
PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: Sunday A. M. 's
January 23, 1966

Release 66-1

Lynn Manley
(res: 243-3489)

LEWIS RESEARCH CENTER OBSERVES 25TH ANNIVERSARY

CLEVELAND, Ohio, Jan. 23 -- A shovelful of earth, lifted twenty-five years ago from land already richly steeped in aviation tradition, signaled the beginning of an era here, during which man has traveled faster, higher and farther than ever before.

On Jan. 23, 1941, ground was broken for development of the government's first laboratory devoted to flight propulsion in all its aspects.

Today, scientists and engineers at the Lewis Research Center are looking to the future--still involved with flight propulsion--but now immersed in plans for extended journeys into space.

Lewis was spawned during a period of world-wide conflict, when America's foremost concern was defense of its often-defended principles of freedom and democracy. Much of the emphasis on that defense was

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based on the ability of American aircraft to fly faster, higher, and farther.

To fill the need for government-sponsored research on flight propulsion, Congress, in 1940, authorized construction of a laboratory to study methods of improving all-round aircraft performance: fuels and lubricants, propulsion, de-icing devices, fire suppression systems, etc.

Thus Lewis was born as an expansion of facilities and activities of the National Advisory Committee for Aeronautics, a leader in aeronautical research since 1915.

First called the Aircraft Engine Research Laboratory, the Center was renamed the Lewis Flight Propulsion Laboratory in 1948 in honor of Dr. George W. Lewis, former director of aeronautical research for NACA who guided NACA efforts from 1915 through 1947.

In 1958, NACA facilities and personnel were absorbed by the new National Aeronautics and Space Administration, created by Congress to broaden U. S. efforts in aeronautics and space. At that time, the Cleveland facility became the Lewis Research Center.

Cleveland was selected as the location for the new facility on Nov. 25, 1940 after a special committee surveyed potential sites offered by 62 cities. It proved a natural choice with an abundance of electrical power, a skilled labor market, and perhaps most important, its proximity to major aircraft engine manufacturers.

The initial 200 acres selected for the main laboratory were adjacent to Cleveland Hopkins Airport and familiar to millions around the world as the site for the famous Cleveland Air Races. Later, 150 acres were added to complete the present facility.

Construction was begun on Lewis' flight research hangar early in 1941 and a year later a staff of scientists, engineers and skilled specialists was at work on problems with World War II aircraft. Few persons could envision the rapid advances that would be made from reciprocating engines, through development of the jet engine, to present day rocketry.

The late Dr. Edward R. Sharp was named to supervise overall activities at AERL in 1940 and subsequently became director of the center. Dr. Sharp, who retired in 1961 after a distinguished NACA/NASA career as an administrator-engineer, was named Director Emeritus of Lewis prior to his death in 1962.

Dr. Abe Silverstein who, like many of his NACA associates, began his career at the Langley Research Center in Virginia, became director of Lewis in late 1961. He had transferred to Cleveland in 1943 to direct efforts in propulsion aerodynamics and, later, all research activities at Lewis.

In 1958, Dr. Silverstein moved to Washington to help plan and organize NASA, subsequently heading NASA's Office of Space Flight Programs. Under Dr. Silverstein's leadership, many of NASA's early programs, including Project Mercury, were initiated.

Because of the high priority given to construction of initial facilities at Lewis, the laboratory staff was able to devote nearly three years during World War II toward improvement of fighter and bomber aircraft.

By the end of the war, nearly 2,500 persons were employed at the Cleveland facility, an employment figure that was to remain fairly stable for about 15 years. With world peace assured, engineers turned their efforts toward a new era in aeronautics: jet propulsion.

America's decision to fight World War II with conventionally-propelled aircraft left little time for NACA engineers to concern themselves with jet propulsion, although some far-sighted individuals envisioned this aeronautical breakthrough that began even before the end of the war. In fact, many persons already were designing--at least, in mind--rocket engines for aircraft and missiles that would propel vehicles and men to unheard of speeds and altitudes. And NACA engineers had analyzed jet engine possibilities, had worked on combustion in a ducted fan, and were working on an axial flow compressor; these efforts had been shelved during World War II.

Thus, in 1946, with facilities available for continued research in propulsion, NACA engineers turned their attention to the development of jet engines, initially for military aircraft and ultimately for America's first commercial jetliners. Man's first supersonic flight in 1947 spurred these efforts immensely.

Many of the country's aeronautical leaders were now working on rocket propulsion, again with emphasis on intercontinental ballistic missiles. Some, though, envisioned orbiting scientific spacecraft and sending probes deep into space, while a few predicted man himself would travel into space.

At Lewis, in the late 1940's, engineers were already moving beyond conventional rocketry into high-energy propulsion using liquid hydrogen, hydrazine, diborane, liquid fluorine, etc. As a result, in the early 1950's, engineers at Lewis were able to fire successfully a 5,000-lb. thrust hydrogen-fueled engine, thus paving the way for development of the propulsion technology that made possible America's current plans to land men on the Moon. For hydrogen proved the ultimate chemical fuel necessary to accomplish missions of the 1960's and 1970's.

There were other aerospace problems under study at Lewis in addition to those directly connected with propulsion: systems to provide on-board power for orbiting spacecraft; improvement of materials to withstand extreme temperatures; work on bearings and lubricants, designed to operate under harsh conditions. But always the emphasis was on propulsion technology--the key to U. S. plans for the exploration of space.

Extensive research and test facilities have formed the basis for experimental work at Lewis over the years. In 1949 Congress authorized a vital bill that was to play a significant role in the future of aeronautics and space.

The Unitary Wind Tunnel Plan provided for a series of research wind tunnels to be built at government facilities throughout the country, including Lewis. Two of these, the 10 by 10 foot and 8 by 6 foot supersonic wind tunnels, were designed and constructed in Cleveland, thus making possible large-scale tests of American aircraft and space vehicles. Such aircraft as the X-15, XB-70, and F-111 and vehicles like the Saturn IB, Saturn V and Atlas-Centaur owe much of their development success to preliminary studies conducted in Lewis wind tunnels.

One of the most valuable facilities at Lewis, however, is one initially completed in 1944 for aerodynamic research on aircraft. The Altitude Wind Tunnel--actually two chambers including one 300 feet long--has seen years of valuable service from aeronautics through the Space Age. It has been used for full-scale testing of aircraft and their engine systems and Project Mercury, where it supported spacecraft separation tests and development of Mercury's retro-rockets, as well as a device designed to train U. S. Astronauts to control a spacecraft during periods of tumbling.

Still active after almost 25 years, the Altitude Wind Tunnel (after modifications, now called a Space Power Chamber) currently supports development of the Centaur space vehicle, the country's first rocket to be powered by liquid hydrogen. A full-scale Centaur vehicle is mounted in the chamber where atmospheric and thermal radiation conditions are simulated at altitudes up to 90 miles.

Following rapid advances in aircraft and missile technology in the 1950's, Lewis experienced a need for expansion, partially because of the need for facilities to conduct tests on high-energy rocket engines and propellants.

Near Sandusky, Ohio, about 50 miles from the Lewis Center, a 6,000-acre auxiliary facility was established to further expand Lewis work in rocketry and to undertake a new area of research: the harnessing of nuclear energy for interplanetary exploration.

The Plum Brook Station, formerly a U. S. -owned TNT manufacturing plant, proved an ideal location for the reactor, as well as numerous facilities to static-test high-energy rocket engines and full-scale space vehicles. Ground was broken for the reactor, a 60,000 thermal kilowatt device, in 1956 and construction of the $15-million facility was completed in 1961.

Reaching its full 60,000 kilowatts of power in 1963, the Plum Brook reactor is now being used in basic research experiments associated with NASA's plans to develop a nuclear rocket for interplanetary exploration, as well as development of components and systems for space nuclear power.

The demand for additional Space Age ground-test facilities made Plum Brook a natural site for huge devices to duplicate the conditions of outer space. Presently under construction is a $25 million Space Propulsion Facility which will have a 100 by 200 foot space environmental chamber in which pressure and temperature conditions existing at altitudes up to 100 miles can be simulated for periods up to two weeks. Evaluation of complete spacecraft, including the operation of nuclear-electric propulsion systems, will be done in the facility.

A second major facility, soon to be completed at Lewis, is a 500-foot deep shaft to permit zero gravity studies of liquids. The concrete-lined shaft will subject experiments to ten seconds of weightlessness to determine affects of zero-G on liquid fueled vehicles orbiting in space.

Thus from an initial Congressional appropriation of $2,000,000 in 1941 and as a result of the continuing need for ground-test facilities over the years, Lewis has emerged as a major research and development laboratory valued at $200,000,000.

With the creation of NASA by Congress in 1958, the Lewis Research Center was assigned new and demanding research tasks in support of America's space exploration plans. With the new missions came the first noticeable increase in staff in some 15 years.

Between 1961 and 1963 Lewis staff members combed the country for experienced scientists and engineers to join the Lewis team. Today, Lewis and its Plum Brook facility employ almost 5,000 persons, including 1,900 engineers and scientists.

Lewis experienced a second dramatic change in late 1963 with the assignment of several major development programs to complement its well-established efforts in basic research. The Center is now responsible for the Atlas-Centaur space launch vehicle, the high-energy rocket scheduled to land Surveyor spacecraft on the moon to seek out landing sites for U.S. Astronauts, and Atlas-Agena, the reliable vehicle that powered photo-taking Ranger spacecraft to the moon and Mariner craft to Venus and Mars.

The Mars mission, resulting in the first close-up pictures of that planet, is considered one of America's most significant space successes.

The Center also was assigned management responsibility for the 1,500,000-lb. thrust M-I hydrogen engine and the 260-in. solid motor, the two largest propulsion systems currently under study in the U.S. In the power generation field, Lewis continued its development of the SNAP-8 (System for Nuclear Auxiliary Power) system, designed to provide 35 kilowatts of on-board power for use in space.

More recently, the Center has again become involved in air-breathing propulsion research, in support of plans for a supersonic commercial air transport. As in the past but with emphasis on higher performance and economy and safety of operation, this work deals with supersonic combustion, turbines, compressors, materials, bearings and lubricants, and seals and hydraulic fluids.

Traditionally, efforts at Lewis have always been geared to the future: improving technologies for missions extending years ahead. Current efforts follow that trend, with Lewis scientists and engineers delving into the propulsion and power generation problems of tomorrow.

Lewis is an acknowledged leader in advanced propulsion. The first ion engine to operate in space was designed by a Lewis engineer. Others are at work on electric propulsion devices to propel spacecraft to the far reaches of the universe. Another advanced field is the nuclear rocket and again Lewis engineers are providing basic technological information in areas such as reactor physics and shielding, flow systems, nozzles and other components, and testing of nuclear rocket systems under simulated space conditions.

A strong effort is continuing in improving and advancing space power generation systems. From simple solar cells and batteries used on early American satellites, scientists are now working on nuclear-electric systems, thin-film solar cells, and fuel cells--all with capabilities to provide power for missions extending millions of miles into space and requiring perhaps years to complete.

Other advanced work is taking place in magnetics and superconductivity, materials and structures, fabrication techniques, fluid systems, electronics and air-breathing propulsion.

Success in research and development, of course, like any other endeavor, is due to people, and the Lewis Research Center depends on a highly qualified and diversified staff to accomplish its mission. Of the more than 1,900 professional persons on the Lewis staff, 103 are Ph.D's, and 432 hold master's degrees. Many others at Lewis are pursuing graduate studies to obtain advanced degrees.

And of the 152 persons employed on the staff Jan. 1, 1942, 47 are still here.

The past 25 years have witnessed truly remarkable strides in aeronautics and space activities. In 1941, man had the capability to fly 300 miles-per-hour and to attain altitudes of perhaps 30,000 feet. Today he orbits the earth at 17,500 miles-per-hour, performing uncanny feats; sends information-seeking probes millions of miles into space; and within a few years will set foot on the Moon.

The future? No one can really predict. Members of the Lewis staff, however, look to the future eagerly, for the tasks they accomplish today will provide much of the impetus for tomorrow's accomplishments.

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LRC

FOR RELEASE: IMMEDIATE

Release 66-2

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Jan. 14 -- Establishment of an assistant director for launch vehicles and a division to direct air-breathing propulsion research are among major changes effected by a reorganization of activities at the National Aeronautics and Space Administration's Lewis Research Center.

Dr. Seymour C. Himmel, former head of the Agena Project Office, is the new Assistant Director for Launch Vehicles. His responsibilities include the Agena, Centaur and Atlas project offices, embracing all of Lewis' launch vehicle activities. The three project offices will be headed by Warren Plohr, Edmund R. Jonash and Edward F. Baehr, respectively.

The Air-Breathing Engine Division will be headed by J. Howard Childs and will support Lewis propulsion research for the supersonic transport program, including work being conducted at Lewis and under contract to the Center. Robert R. Godman and Jack B. Esgar have been named assistant chiefs of the new division.

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Appointed to direct the Spacecraft Technology Division, formerly under Childs, was Channing C. Conger.

Two new staff offices also have been created. An Office of Facility Planning and Coordination will be headed by Godman. It will assist and advise the center director in planning and evaluating test facilities. Carl F. Schueller will direct the Office of Development Evaluation and Management Review, which will provide staff assistance concerning technical and procurement activities and also will conduct the center's reliability and quality assurance program.

Leonard J. Obery has been appointed Chief, Office of Development Plans and Programs, formerly headed by Schueller.

All of the changes are effective immediately.

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FOR RELEASE: IMMEDIATE

Release 66-4

Hugh W. Harris

CLEVELAND, Ohio, Jan. 21 -- More than $9.5 million in major contracts were awarded during December by the National Aeronautics and Space Administration's Lewis Research Center here in support of its space research and development programs.

Contracts of $25,000 or more went to companies in five states. They are listed alphabetically by state and city.

CALIFORNIA:	$6,646,994
Canoga Park	North American Aviation, $50,000, diagnostic studies in thermionic conversion.
Glendale	Trio Tech Co., $37,500, 20,000 G pound accelerator.
Malibu	Hughes Aircraft Co., $49,949, measurement of charge exchange cross-section of mercury. Hughes Aircraft Co., $41,651, develop and demonstrate a method to deflect the beam from an ion thrustor.
Palo Alto	Varian Associates, $48,020, spectrometer, variable electron spin resonance accessory and a super heterodyne accessory.

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CALIFORNIA (Continued)	
San Diego	General Dynamics, $438,400, investigation of materials and components for use in a thermionic space power reactor.
San Ramon	Aerojet-General Corp., $53,808, study of thermal gas-cooled reactor technology.
Santa Fe Springs	Le Fiell Mfg. Co., $38,805, stainless steel tapered rocket engine tubes.
Sunnyvale	Lockheed Aircraft Corp., $5,888,861, Agena vehicles for Lunar Orbiter missions.
KENTUCKY:	$33,000
Paducah	U.S. Atomic Energy Commission, $33,000, afterburner assemblies.
MASSACHUSETTS:	$627,347
Wilmington	AVCO Corp., $627,347, electrothermal engine systems.
OHIO:	$1,596,705
Cleveland	Doan Electric Co., $815,000, instrumentation, data acquisition and controls systems for the Space Propulsion Facility at Plum Brook. Associated Builders Corp., $443,000, construction of the building addition to the 10x10 SWT for data processing. PEMCO, Inc., $71,950, engine parts. Hewlett-Packard, $33,905, recording systems.

OHIO (Continued)	
North Royalton	Central Contractors, $181,630, construction of a high load tensile testing facility at Lewis.
Springfield	Eagle Tool & Machine, $51,220, complete machine forming and machining fixtures.
PENNSYLVANIA:	$681,127
Ambler	Lawrence Systems, $64,945, servo systems test assembly.
Montgomeryville	Livingston Electronic Corp., $143,332, low temperature battery.
Philadelphia	Araco Co., Inc., $429,000, mechanical and electrical systems for combustor research.
Willow Grove	Abar Corp., $43,850, vacuum oven.

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FOR IMMEDIATE RELEASE

LRC

Release 66-7

Hugh W. Harris

CLEVELAND, Ohio, Mar. 3 -- More than $2.2 million in major contracts were awarded during January by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 10 states. They are listed alphabetically by state and city.

KENTUCKY:	$34,135
Paducah	U. S. Atomic Energy Commission, $34,135, cooling and lubricating loop.
CALIFORNIA:	$819,876
Redondo Beach	TRW, Inc., $148,470, investigation of resin system for improved ablative materials. TRW, Inc., $524,000 guidance equation support NASA Atlas/Agena mission.
Sunnyvale	Lockheed Aircraft Corp., $147,406, OAO-B and OAO-A2 program definition.
CONNECTICUT:	$82,359
Farmington	United Aircraft Corp., $82,359, Centaur phase II guidance system study.

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MARYLAND:	$81,950
Laurel	Hydronautics, Inc., $51,950, research on cavitation damage in high temperature liquid alkali metals.
Silver Spring	U. S. Naval Ordnance Lab., $30,000, determine radiative properties of hydrogen gas.
MICHIGAN:	$30,125
Ann Arbor	Easco Sparcatron, $30,125, precision electrical discharge machine.
NEW YORK:	$492,000
New York	Burns & Roe, Inc., $492,000, design of expansion of Propulsion Systems Laboratory for Supersonic Facility.
OHIO:	$319,611
Cleveland	Hewlett Packard, $53,220, recorder systems. Feldman Brothers, Co., $27,809, construction of a concrete steam trench and installation of steam and return piping. Lake Erie Electric, $77,730, process instrumentation systems, process control systems and lighting for combustor test rig.
Columbus	Keinath Inst. Co., $35,930, multiple chart recorder.
Mansfield	R. G. Beer, $31,447, foundation for 200,000 gallon deionized water tank and tank painting. R. G. Beer, $32,550, construction of addition to the existing Rocket Systems Research Facility, Plum Brook.
North Royalton	Central Contractors & Builders, $27,430, modifications and additions to the Liquid Metals Components Cleaning Facility.

OHIO (Cont'd)	
Sandusky	Zoellner Plumbing & Heating, $33,495, install government furnished booster compressor.
OREGON:	$97,140
McMinnvile	Field Emission Corp., $97,140, research on the behavior of various absorbates on metal.
PENNSYLVANIA:	$131,899
Philadelphia	Araco Co., $78,500, fabricate and install hot air piping system.
Pittsburgh	Westinghouse Electric Corp., $53,399, study of electron collisions in metal vapors.
VIRGINIA:	$148,618
Richmond	Texaco Experiment Inc., $148,618, improved ablative materials.

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FOR IMMEDIATE RELEASE

Release 66-16

Hugh W. Harris

CLEVELAND, Ohio, April 14 -- More than $2.9 million in major contracts were awarded during February and March by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 9 states and the District of Columbia. They are listed alphabetically by state and city.

CALIFORNIA:	$865,785
Canoga Park	North American Aviation, Inc., $107,933, development of breadboard model of an all pneumatic neutron flux detector. North American Aviation, Inc., $104,925, program to determine solubility of refractory metals and alloys in alkali metal.
Mountain View	Vidar Corp., $46,200, FM multiplexed constant bandwidth data signal conditioning system.
Pasadena	Electro-Optical Systems, Inc., $123,904, fabricate and test magnetic annular wall accelerator (MPD arc).
Redondo Beach	TRW, Inc., $48,454, foam in place materials. TRW, Inc., $134,047, research on ion beam diagnostics and neutralization.

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California (Cont'd)

Sunnyvale	Lockheed Aircraft Corp., $92,183, Agena/Nimbus B/Snap 19 hazard study. Lockheed Aircraft Corp., $208,139, liquid propellant thermal conditioning system.
DISTRICT OF COLUMBIA:	$48,578
	Harris Research Labs., Inc., $48,578, studies of effect of contaminants on interfacial surface.
FLORIDA:	$87,800
Ft. Lauderdale	Systems Engineering Lab., Inc., $87,800, digital acquisition system.
INDIANA:	$246,947
Indianapolis	General Motors Corp., $246,947, evaluation of laminated porous material for high temperature air cooled turbine blades.
ILLINOIS:	$25,429
Urbana	University of Illinois, $25,429, analytical and experimental study of porous metal ionizers.
MASSACHUSETTS:	$563,370
Wilmington	AVCO Corp., $33,820, test section assembly.
W. Lynn	General Electric Co., $529,550, turbojet engines and related support.
MICHIGAN:	$39,996
Detroit	Udylite Corp., $39,996, cleaning system.

OHIO:	$518,022
Cleveland	Wm. Gould & Assoc., $95,000, architect engineer services for preparation of master facilities plan for Lewis and Plum Brook. J. F. Cleary Construction, $235,311, additional construction work for Instrument Research Lab. Standard Oil Co., $50,275, jet fuel and unleaded gasoline. Industrial Electronic Service Co., $77,700, design, manufacture, assembly and test of three signal conditioning systems.
Orville	Flo-Tork Inc., $59,736, rotary actuators and spare parts.
PENNSYLVANIA:	$434,795
Hatboro	Weston-Boonshaft and Fuchs, $33,170, valves.
Philadelphia	General Electric Co., $119,811, microwave driven magnetic plasma accelerator studies. General Electric Co., $249,758, research and development on the pulsed plasma accelerator.
York	Fabricating Engineering Co., Inc., $32,056, hydrogen fired vitiated air heater.
WASHINGTON:	$163,000
Seattle	Boeing Co., $163,000, investigation of allowable stresses for thick-walled tanks.

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FOR RELEASE: IMMEDIATE

Release 66-19

Joann T. Temple
(res: 777-0865)

CLEVELAND, Ohio, May 5 -- Can a rocket engine run continuously for six months?

Yes, and even longer, according to electric propulsion researchers at the National Aeronautics and Space Administration's Lewis Research Center here who have been operating a single ion rocket engine 24-hours-a-day, 7-days-a-week since October 14, 1965.

Gene Pawlik, of Lewis' Ion Physics Branch, explains that six months to one year is a reasonable operating time in which to propel unmanned scientific spacecraft to other planets.

Electric rocket engines, while they produce little thrust in comparison to the gigantic chemical engines, can operate for long periods of time. Thus a spacecraft powered with electric engines would be "under power" all the way to Mars or Venus or, perhaps, even further.

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The engine now being tested at Lewis is a mercury bombardment rocket, a design originated at Lewis and successfully tested in space in a smaller model on the SERT-I (Space Electric Rocket Test) flight in 1964. It uses one kilowatt of electric power to ionize molecules of mercury and accelerate them in 6-inch-diameter exhaust beams at speeds up to 100,000 mph.

Other industrial contractors, such as Electro-Optical Systems, Inc., and Hughes Aircraft Co., are also involved in long-duration tests on concepts similar to that originated at Lewis. This work is under the technical guidance of Lewis.

This tremendous jet velocity is the advantage of the ion engine since it requires so little propellant. Such engines will not operate except in a vacuum tank or in space. Spacecraft using these engines would have to be hoisted into orbit by a chemical booster before the electric engines could start the spacecraft on its interplanetary voyage.

This life test is part of Lewis' advanced research and development work aimed at preparing to meet the propulsion and power requirements of future space missions beyond the Moon.

Other NASA centers as well as Lewis are building the technology

necessary to develop the efficient, reliable, lightweight electric power systems that would be necessary before electric engines could be used for primary propulsion.

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FOR RELEASE: IMMEDIATE

Release 66-23

Hugh W. Harris

CLEVELAND, Ohio, May 17 -- More than $1.1 million in major contracts were awarded during April by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in four states. They are listed alphabetically by state and city.

CALIFORNIA:	$836,053
Los Angeles	Aerospace Control, $48,950, solar radiation simulator system.
Palo Alto	Varian Associates, $34,450, vacuum life test station.
San Diego	Whittaker Corporation, $83,448, high energy density secondary battery electrode screening program.
Santa Monica	Douglas Aircraft Co., $669,205, eight standard Agena clamshell shroud systems, spare parts and reports plus an option to procure three additional shrouds.

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OHIO:	$66,969
Cleveland	Honeywell Inc. $66,969, modify government-owned Honeywell instruments.
TEXAS:	$57,320
Amarillo	Jack B. Kelley Co., $57,320, ICC test of tube trailers.
WASHINGTON:	$215,946
Seattle	Boeing Co., $215,946, Mariner-Venus shrouds and associated equipment.

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FOR RELEASE: MONDAY A. M. 'S
June 13, 1966

Release 66-29

Joann T. Temple
(res: 777-0865)

CLEVELAND, Ohio, June 13 -- Could a supersonic transport flying three times the speed of sound use liquid methane as a fuel?

Yes, and it might be a good idea. According to propulsion researchers at the National Aeronautics and Space Administration's Lewis Research Center here, liquid methane fuel could increase a plane's carrying capacity and reduce operating costs as much as 30 per cent.

Richard J. Weber, Head of Lewis' Mission Analysis Branch, points out that methane has a heat of combustion 16 per cent higher than the commonly used JP or kerosene aircraft fuels, is readily available from natural gas, and would present no major problems in re-design of turbojet or turbofan engines.

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Since liquid methane is a cryogenically cold fluid, there would be some problems in handling and storing the fuel. However, Weber said these problems might be offset in development of the SST because "in some respects, the engine may be easier to develop for methane than for JP fuel."

Discussing his work before the Second Propulsion Joint Specialist Conference of the American Institute of Aeronautics and Astronautics beginning in Colorado Springs today, Weber noted:

"Although many varieties of aircraft could benefit from the use of methane, its advantages can be illustrated in terms of a representative SST configuration." His study included economic factors, airplane performance, and an analysis of methane-oriented component technology.

In concluding, Weber warned that substituting "an entirely new type of fuel for ordinary commerical operation is not to be contemplated lightly. However, the benefits of using methane for the SST and possibly other airplanes are so great that a large-scale program of analysis and research to substantiate the concept seems to be amply justified."

His paper, titled "Methane-Fueled Propulsion Systems," was

co-authored by James F. Dugan, Jr., and Roger W. Luidens.

Lewis scientists did not limit themselves to a discussion of aircraft propulsion during the five-day meeting. John F. Staggs of Lewis' Electromagnetic Propulsion Division described an electric rocket engine that may be suited for satellite attitude control and station-keeping missions.

The experimental engine, a contact-ionization type, weighs less than a third of a pound. The report on this engine, "Experimental Performance of a Low-Thrust, Divergent-Flow, Contact-Ionization Electrostatic Thrustor," co-authored by Walter C. Lathem, concluded:

"While the potential advantage of this thrustor appears to be its long electrode and heater lifetime, improvements in ionizer heat shielding could increase the power efficiency considerably, which would result in a decrease in power-to-thrust ratio for a given specific impulse."

Two other Lewis scientists took up the problem of unstable burning in rocket engines. Acoustic instability in a rocket engine occurs when the combustion energy is released in a manner that reinforces the acoustic oscillations. This rocket "screaming" or "chugging" can be

so violent that it destroys the vehicle. Thus analytical models and experimental studies of instability are always of interest to rocket engineers.

The two Lewis papers on this general subject were: "Analysis of Frequency Response Characteristics of Propellant Vaporization," presented by Marcus F. Heidmann and co-authored by Paul R. Wieber; and "Storable Propellant Combustion Instability Program at Lewis Research Center," presented by William K. Tabata and co-authored by Robert J. Antl and David W. Vincent.

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FOR RELEASE: IMMEDIATE

Release 66-30

Hugh W. Harris

CLEVELAND, Ohio, June 16 -- More than $8 million in major contracts were awarded during May by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 10 states. They are listed alphabetically by state and city.

CALIFORNIA:	$5,956,004
Canoga Park	North American Aviation, Inc., $81,828, axial pump rotordynamic study.
Huntington Beach	Douglas Aircraft Co., Inc., $54,912, experimental program for an improved zinc electrode.
Pleasanton	General Electric Co., $705,000, development of the fission gas containment concept employing a UO_2 W-coated particle dispersion fuel.
Sacramento	Aerojet-General Corp., $1,895,443, project definition and motor design phase for 260-SL-3 solid rocket motor.
San Diego	General Dynamics Corp., $36,226, engineering services for the study, design and modification of a F106B aircraft for flight test. General Dynamics Corp., $49,995, nine support fixture and shipping container assemblies.

- more -

CALIFORNIA (Continued)

San Fernando	Computer Measurements Co., $32,600, digital counters.
Sunnyvale	Lockheed Aircraft Corp., $1,500,000 supplies and services for the modification of the standard Agena for the OAO-B and OAO-A2 missions. Lockheed Aircraft Corp., $1,000,000, Agena adaptation, vehicle integration management and systems contractor support (Applications Technology Satellite missions). Lockheed Aircraft Corp., $600,000, initial funding for launch vehicle integration mission modification and systems contractor support for Mariner Venus '67 mission.
COLORADO:	$27,756
Denver	Cryogenic Engineering, $27,756, cryostat and control system.
CONNECTICUT:	$1,009,350
E. Hartford	United Aircraft Corp., $900,000, modified turbojet engine.
Farmington	New England Aircraft Prod. Co., $56,450, air breathing rotor and blade assembly. New England Aircraft Prod. Co., $52,900, compressor rotor and blade assembly.
MASSACHUSETTS:	$242,977
Wilmington	AVCO Corp., $242,977, research and development of a magnetoplasmadynamic arc thrustor.
MINNESOTA:	$27,977
Minneapolis	Rosemount Eng., $27,977, platinum resistance sensor.

NEW JERSEY:	$96,300
Princeton	Radio Corporation of America, $96,300, gallium arsonide thin film photovoltaic solar energy converters.
NEW YORK:	$49,761
Schnectady	General Electric Co., $49,761, refractory metal contamination study.
OHIO:	$437,352
Akron	Akron Steel Fabricators Co., $65,900, one heat transfer tunnel.
Cincinnati	General Electric Co., $199,450, test and evaluate high temperature alkali metal valves.
Cleveland	A. J. Hoffman Co., $25,477, service, labor and material for fabricating, installing, and repairing stairways, guardrails, ladders and platforms. Long Painting Co., $28,671, cleaning, surface preparation and coating of interior areas of Plum Brook Reactor Facility. Feldman Bros. Co., $29,400, extension of an existing LN_2 system at the Electric Propulsion Research Building. Central Contractors & Builders, Inc., $88,454, modifications and installation of electrical equipment in Engine Research Building.
OREGON:	$57,391
McMinnville	Field Emission Corp., $57,391, research on "composite surface work function."
PENNSYLVANIA:	$126,195
Philadelphia	General Electric Co., $126,195, theoretical impact effects of composite projectiles and study of nuclear electric Brayton power plant characteristics.

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News

NASA LEWIS RESEARCH center

21000 BROOKPARK ROAD CLEVELAND, OHIO 44135

PUBLIC INFORMATION OFFICE

PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: IMMEDIATE

Release 66-38

Hugh W. Harris

CLEVELAND, Ohio, Aug. 2 -- More than $17.8 million in major contracts were awarded during June by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 19 states. They are listed alphabetically by state and city.

ARIZONA:	$2,732,741
Phoenix	Garret Corp., $1,988,000 Brayton cycle rotating unit and associated research hardware.
	AiResearch Mfg. Co., $60,152, turbine wheel assembly. Garrett Corp., $503,600, research and development for radial turbo-compressor with oil-lubricated rolling element bearing.
CALIFORNIA:	$3,490,193
Anaheim	Preston Scientific Inc., $168,132, 300 dc amplifiers with associated rack adapters and blank panels.

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Buena Park	Air Reduction Co., Inc., $38,541, helium compressor assembly.
Canoga Park	North American Aviation, $299,000, two-stage bi-propellant injection system. North American Aviation, $316,268, lithium fluorine hydrogen propellant study. North American Aviation, $180,989, research and development of non-aqueous electrolytes.
Mountain View	Vidar Corp., $53,975, digital voltmeters.
Redondo Beach	TRW Inc., $123,892, mercury bombardment thrustor system test.
Sacramento	Aerojet-General Corp., $154,750, coatings for regenerative engines.
San Diego	General Dynamics Corp., $71,000, determination of design load factors for kick stage structure. International Harvestor, $169,936, evaluation of coatings for cobalt and nickel base superalloys. Conic Corp., $28,000, "S" band transmitter. General Dynamics Corp., $49,379, study optical constants of uranium plasma. General Dynamics Corp., $1,384,300, aerodynamic shroud systems for OAO-B and OAO-A2 missions.
Santa Monica	Douglas Aircraft Co., Inc., $197,950, main tank injection pressurization.
Sylmar	Textron Electronics, $50,070, two solar radiation systems.
Sunnyvale	Lockheed Aircraft Corp., $385,000, design, fabrication, testing and delivery of one aluminum liquid hydrogen tank.

CONNECTICUT:		$651,568
Berlin		New England Machine & Tool Co., $91,905, supply two electronic airfoil milling machines and cutters.
E. Hartford		United Aircraft Corp., $163,473, boiler dynamics investigation. United Aircraft Corp., $316,965, design and fabrication of digital attitude control logic system.
Windsor Locks		United Aircraft Corp., $79,225, electron beam welder.
FLORIDA:		$3,098,497
Ft. Lauderdale	*	Systems Engineering Lab., $62,275, central recording systems.
W. Palm Beach		United Aircraft Corp., $78,436, ignition of hydrogen fluorinated oxidizers. United Aircraft Corp., $1,130,607, hydrogen-fluorine engine evaluation. United Aircraft Corp., $999,380, FLOX-methane pump fed engine study. United Aircraft Corp., $157,820, high-temperature static cascade test unit. United Aircraft Corp., $669,979, development of an advanced annular combustor.
GEORGIA:		$215,378
Marietta		Lockheed Aircraft, $215,378, tensile test loops.
ILLINOIS:		$28,046
Arthur		Progress Ind., Inc., $28,046, tank trailers.
INDIANA:		$406,500
Indianapolis		General Motors Corp., $406,500, experimental investigation in an annular cascade sector of highly loaded turbine stator blading.

MARYLAND:	$47,851
Baltimore	Catalyst Research Corp., $47,851, development of a long-life thermal cell.
MASSACHUSETTS:	$243,722
Cambridge	Northern Research & Engineering Corp., $85,000, computer program for combustor analysis.
Waltham	Thermo Electron Engineering Corp., $158,722, performance stability of preferred oriented vapor deposited tungsten emitters for thermionic converters.
MINNESOTA:	$30,519
Minneapolis	Honeywell Inc., $30,519, indicating potentiometric controller.
MISSOURI:	$60,659
Kansas City	Midwest Research Institute, $60,659, investigation into areas of extremely high vacuum technology.
NEW HAMPSHIRE:	$29,900
Concord	Humphreys Corp., $29,900, research program involving the operation of a hydrogen plasma generator.
NEW JERSEY:	$593,551
Camden	Magnetic Metals Co., $115,875, improved magnetic components for inverters and converters.
Matawan	M&T Chemical, Inc., $37,500, electrochemical column type machine tool.
Newark	Engelhard Industries, Inc., $55,575, wire, thermocouple platinum/rhodium.

Paulsboro	Mobil Oil Corp., $62,440, microfog lubrication application system for advanced turbine engine components.
Union	Potter Aeronautical Corp., $51,300, converters, rack adapters, power supplies and calibrators.
Wayne	American Cyanamid Co., $135,961, development of high performance lightweight electrode systems for hydrogen peroxide fuel cells.
W. Long Branch	Electronic Associates, Inc., $35,400, analog computer.
West Orange	Vitro Corp. of America, $99,500, optimization and evaluation of electrophoretic protective coatings for tantalum T-222 alloy.
NEW YORK:	$457,213
New York	Union Carbide Corp., $32,240, carbon felt.
Schenectady	General Electric Co., $137,887, development of high temperature, high current, alkali metal vapor filled thyratrons and rectifiers. General Electric Co., $192,086, development of high temperature ceramic rectifiers thyratrons and voltage reference tubes.
Tonawanda	Union Carbide Corp., $95,000, lightweight multi-layer insulation system.
OHIO:	$5,592,165
Cincinnati	General Electric Co., $73,930, study of gas cooled fast reactor technology. General Electric Co., $654,400, design, fabrication and assembly of a three-stage potassium turbine. General Electric Co., $344,810, fabrication and test of a space power boiler feed electromagnetic pump. General Electric

Cincinnati (Continued)	Co., $2,393,904, development of a single tube potassium boiler. General Electric Co., $139,245, performance and endurance testing of high temperature liquid metal instrumentation. General Electric Co., $172,680, electrical switchgear for space nuclear electric systems. General Electric Co., $118,050, lithium fluoride corrosion tests in contact with columbium alloys.
Cleveland	Union Carbide Corp., $33,600, high purity chromium flake. The Feldman Bros., $42,540, insulating and cleaning air piping system, Propulsion Systems Lab. Advance Asphalt Pav., $32,000, construction of acess roads, installation of asphalt topping, concrete pad and catch basin at various locations. TRW Inc., $55,970, study of asbestos for electrochemical cells. Leads & Northrup Co., $26,500, console for evaluating and checking potentiometer recorders. Honeywell Inc., $93,168, oscillographs and galvos. Hofstetter Construction, $71,903, furnishing and installing a suspended, grid type acoustical ceiling; wall closure and a new lighting system in the Technical Services Bldg. Hatfield Mech., $129,744, modifications and additions to the Mechanical & Piping Systems at the Technical Services Bldg. Advance Asphalt Pav. Co., $29,000, modifying, paving and widening "M" and "K" roads at Lewis. Harshaw Chemical Corp., $161,077, development of cadmium sulphide photo-voltaic film cell. Honeywell Inc., $29,520, recorders.
Columbus	Consolidated Electrodynamics, $79,850, data recording system. Battelle Memorial Institute, $40,950, hot isostatic bonding of government-furnished materials into fuel plates.
Fremont	* Valley Electric, $141,600, install high speed liquid hydrogen loop at facility C at Plum Brook.* Valley Electric, $79,300, design, fabricate and install a vent and pressurization system at Plum Brook.

Fremont (Continued)	*	Valley Electric Co., $248,440, additional electrical, instrumentation and control systems for the Spacecraft Propulsion Research Facility.
Norwalk	*	Leon Riley Excavating Co., $32,579, construction of waterbound macadam roadway, road widening and parking lots at Plum Brook. * Price Construction Co., $43,574, construction of parking lot at Plum Brook. * Price Construction Co., $25,520, patching and single seal coating of roads, driveways, and parking lots at Plum Brook.
Parma		Union Carbide Corp., $232,361, development of fuel electrodes.
Sheffield Lake	*	Commercial Diving Service, $27,450, repairing and cleaning Rye Beach intake line and crib.
Strongsville		Sachsen Builders Corp., $38,500, repair brick work, stonework and masonry work and clean and waterproof the Chemistry Lab Bldg., Engine Res. Bldg., and Flight Res. Bldg.
PENNSYLVANIA:		$229,141
Chester		Sun Shipbuilding & Dry Dock Co., $145,705, study of welding processes for fabricating large structures of 18 per cent nickel 200 grade (VAR) maraging steel.
Harrisburg		Amp Inc., $36,276, patchboard programming components.
Woodlyn		Columbia Research Lab., $47,160, 24 charge amplifier systems.
TENNESSEE:		$99,500
Oak Ridge		Oak Ridge Technical Enterprise, $99,500, positive ion accelerator.

VIRGINIA:	$213,750
Alexandria	Mt. Vernon Research, $213,750, launch and ascent simulation system.
WASHINGTON:	$660,090
Seattle	Boeing Co., $200,090, liquid oxygen positive expulsion bladders. Boeing Co., $460,000, design, fabrication, testing and delivery of one aluminum liquid hydrogen tank.

* Contracts for Lewis' Plum Brook Station near Sandusky, Ohio.

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LEWIS RESEARCH center

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PUBLIC INFORMATION OFFICE

PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: IMMEDIATE

Release 66-40

Hugh W. Harris

CLEVELAND, Ohio, Aug. 4 -- Dr. Abe Silverstein, Director of the National Aeronautics and Space Administration's Lewis Research ~~Center,~~ announced today that Lewis has been designated by NASA Headquarters as the Center responsible for the development of space vehicle design criteria in the area of chemical propulsion.

At the same time he announced the appointment of Howard W. Douglass as Chief of the Design Criteria Office and Assistant Chief of the Chemical Rocket Division.

The basic objective of the new program is to establish soundly conceived design criteria and procedures defining the boundaries or physical limits to which chemical rockets should be designed.

"This program is extremely important," Dr. Silverstein said. "It will compile all of the knowledge of chemical propulsion design that has been developed in NASA, the Department of Defense, other government

- more -

agencies and private industry. This will provide a designer with the full background necessary to confidently design chemical propulsion systems or improve older ones. The result will be tremendous savings in time and money as well as insuring that hardware will be completed when we need it."

The Design Criteria Office reports directly to Dr. Silverstein.

Prior to his two new assignments, Douglass headed the FLOX Project Office. FLOX is a high energy oxidizer combining liquid fluorine and liquid oxygen. Douglass has been active in research and development work connected with the use of liquid fluorine for many years. He graduated from Massachusetts Institute of Technology with a B. S. degree in chemistry in 1947, and joined Lewis a year later.

His first assignment was the experimental evaluation of turbojet fuels. In 1949 he began his work with high energy rocket propellants and pioneered in the experimental investigation of liquid fluorine as an oxidizer for fuels such as diborane, ammonia, hydrazine and JP-4.

In 1957, as head of the Rocket Propellants Section, he lead Lewis efforts which culminated in the design and successful testing of the first regneratively-cooled rocket engine using liquid hydrogen and liquid fluorine. This and further work helped establish the high performance and good cooling capabilities of the very high energy cryogenic propellants and helped lead to the present development of hydrogen-oxygen rocket systems

in this country.

In 1960 as Head of Hydrogen-Fluorine Systems Section, he directed applied research on engine design requirements for cooling with liquid hydrogen, flow components design and materials selection for use with fluorine. Since then his office has managed the test firings of an RL-10 engine using liquid hydrogen and liquid fluorine and an Atlas sustainer engine using FLOX as the oxidizer.

Douglass has been active on several joint NASA-Department of Defense committees, as well as national committees of the American Institute of Aeronautics and Astronautics. Prior to its merger with AIAA, he served as president of the Cleveland-Akron Section of the American Rocket Society, and later received an award for service to the section.

He has been active in the Cleveland Technical Society, participating in summer science student programs and has served as chairman of the society's television committee.

Douglass and his wife, the former Lois Wilson, reside in Berea with their two children, Howard Winn and Deede.

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FOR RELEASE: IMMEDIATE

Release 66-45

Lynn Manley
(res: 243-3489)

LRC:

CLEVELAND, Ohio, Aug 12 -- The National Aeronautics and Space Administration's powerful nuclear reactor reached a milestone in space research this week by completing its 50th cycle just slightly more than three years after the test facility first achieved full power.

The reactor, operated by the Lewis Research Center's Plum Brook Station near Sandusky, Ohio, is being used by NASA to conduct basic research associated with plans to develop a nuclear-powered rocket and nuclear space power systems. The 60 megawatt facility provides radiation conditions similar to those anticipated in full-scale space nuclear rocket systems and power generation devices.

Construction of the $15 million reactor was completed in 1961 and it went to full power in April 1963. The first experiment was started on July 17, 1963. Since then, more than two dozen experiments have been

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investigated during the 50 operating cycles. (A full power cycle runs about 10 days after which the reactor is shut down for two to three days to change or monitor experiments and re-fuel).

Reactor experiments are conducted in four areas: nuclear rocket experiments, energy conversion experiments, studies of basic radiation effects, and basic physics experiments.

Materials and components that may be used in the engineering of nuclear rockets or nuclear-fueled power plants are being subjected to radiation in the reactor. Current investigations include irradiation of aluminum, titanium, nickel alloys and ferrous metals at temperatures of -430 degrees F; nuclear-electric subsystems and components such as silicon diode rectifiers, zener diodes, transistor circuits, semiconductor materials, integrated circuitry; clad fuel forms for thermionic emitters; specimens of concrete; materials for possible rocket engine and component fabrication; and fuels embedded in refractory compounds.

H. B. Barkley, Jr., chief of the Reactor Division, described research progress in the reactor within the past year. Major accomplishments include: completion of a comprehensive screening plan for irradiation of materials at cryogenic temperatures; installation of cryogenic in-pile loops -- a helium recycle loop and a once-thru-helium system -- for testing

NERVA (Nuclear Engine for Rocket Vehicle Applications) components; and unfueled irradiations conducted with a 100 kilowatt helium cooled loop.

Barkley said future plans for the reactor include initiation of irradiation testing using new cryogenic loops, and increasing fuel loadings to permit longer cycles and thus achieve better fuel economy.

Barkley also noted several major additions to the reactor facility, including an experiment assembly and test building, reactor offices, waste handling building and a service equipment building annex.

The Plum Brook reactor was designed by Lewis engineers in close consultation with the Atomic Energy Commission. Ground was broken for the facility in October 1956.

The reactor, which develops 60,000 kilowatts of thermal power when operating at full capacity, is a light-water cooled and moderated device. The reactor core, a 30-inch cube, holds 27 fuel elements composed of an enriched uranium-aluminum alloy clad with aluminum.

The core is surrounded by a primary beryllium reflector with water as a secondary reflector. The core is under 21 feet of water during operation and is mounted in a vertical, cylindrical, stainless steel clad pressure vessel.

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FOR RELEASE: IMMEDIATE

Release 66-54

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Sept. 16 -- About 2,000 top executives of government, business and industry will tour research facilities at the National Aeronautics and Space Administration's Lewis Research Center here Oct. 4-7, 1966.

Purpose of the 1966 NASA-Lewis Inspection is to brief aerospace leaders on research and development progress at the Cleveland Center. Identical programs will be held on each of the four days, followed by an Employee Open House on Sunday, October 9.

Emphasis during the all-day Inspection will be on Lewis' work in advanced research and technology. Formal presentations and exhibits will focus on work in: air-breathing engines, materials, basic research, space vehicles, advanced chemical rockets, space power generation and electric propulsion.

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In announcing the Inspection, Dr. Abe Silverstein, Lewis director, said the occasion has been planned so that visitors might examine some of Lewis' newest research facilities and learn the scope of the Center's work in support of NASA missions.

First-day visitors will be welcomed to Lewis by Dr. Silverstein and James E. Webb, NASA Administrator. Other NASA officials will serve as hosts during the ensuing three days.

Such inspections of NASA facilities are relatively new; however, they were held periodically from 1926 to 1958 under the National Advisory Committee for Aeronautics, NASA's predecessor. The first NACA inspection was held at the Langley Research Center in Virginia in 1926 and the last at the Ames Research Center in California in 1958. Lewis hosted its last inspection in 1957. They were discontinued during World War II. In 1959 and 1964 Langley held the only inspections since NASA was created in 1958.

Dr. Silverstein has named Willson H. Hunter as manager of the Lewis Inspection. Hunter, a veteran NACA/NASA engineer who has worked both at Lewis and at NASA Headquarters in Washington, also managed the 1957 Lewis inspection. He is being assisted this year by a team of Lewis staff members.

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PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: IMMEDIATE

Release 66-56

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Sept. 16 -- Progress in aircraft turbine engine development will be discussed today by Dr. Abe Silverstein, Director of NASA's Lewis Research Center, in London, England, in a talk before the Fifth Congress of the International Council of the Aeronautical Sciences (ICAS).

The ICAS was formed in the fall of 1956 to encourage free interchange of information on all phases of mechanical flight. All organized national associations dedicated to the advancement of aeronautical and space sciences, technology and engineering are eligible to participate. Host to this congress of the ICAS is the Royal Aeronautical Society of Great Britain which is celebrating its 100th anniversary. The American Institute of Aeronautics and Astronautics cooperated in the congress arrangements on behalf of the U.S. Dr. Silverstein is a Fellow of both the Royal Aeronautical Society and the AIAA.

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Commercial supersonic transports and vertical take off and landing aircraft require greatly improved engine efficiency over the types of engines flying today. One way to gain this efficiency is to increase the temperatures at which the engines operate. This, however, creates serious materials problems. For instance, even a modest rise in turbine inlet temperatures greatly lowers the stress rupture life of present superalloys.

Lewis research into these and other areas are being discussed by Dr. Silverstein who envisages aircraft gas turbine engines operating at temperatures in cruising flight of from 600 to 700 degrees F. above current values.

Dr. Silverstein also discussed Lewis studies on the use of liquid methane as a fuel. Because it has higher heating value than present jet fuels, greater cooling capacity and a lower price per pound, Lewis engineers have estimated that the payload of a commercial supersonic transport might be increased by 30 per cent through the use of liquid methane and the direct operating cost reduced a like amount.

The use of liquid methane in subsonic aircraft and vertical take-off and landing craft is also of great interest, Dr. Silverstein says. He pointed out, however, that much more needs to be learned about both flight and ground equipment before liquid methane can be seriously considered as an aircraft fuel.

Dr. Silverstein called the prospects for reducing the noise levels associated with fan-jet powered aircraft as encouraging. He described work being done in several areas at Lewis. One area of work involves the use of a porous metal lining for the inlet cowling over a 1 inch cavity. The second involves the use of increased spacing between rotor and stator blade rows. A third is a study of the use of slots on compressor blades to make it possible to increase loading on fan and compressor blades. Slots are commonly used to delay stalling of aircraft lifting surfaces, but they have not yet been applied to turbo-jet fans.

Dr. Silverstein concluded, "The current work on noise suppression holds substantial promise for alleviation of the noise problem of the fan-jet engine."

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FOR RELEASE: IMMEDIATE

Release 66-58

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Sept. 23 -- More than $2.6 million in major contracts were awarded during July and August by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 8 states. They are listed alphabetically by state and city.

ARIZONA:	$62,049
Phoenix	Garrett Corp., $62,049, six gas bearings diaphragm assemblies, conversion kit parts and turbine drive assembly.
CALIFORNIA:	$1,625,735
Canoga Park	North American Aviation Inc., $61,750, supply one superconducting magnet assembly.
Fullerton	Beckman Instruments, $325,000, DC amplifiers.
Hawthorne	Gulton Industries, $44,895, power conditioning packages.
San Diego	General Dynamics Corp., $1,194,090, Atlas launch and test services.

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KENTUCKY:	$54,080
Paducah	U.S. Atomic Energy Commission, $54,080, 11-foot diameter quick-operating valve for Plum Brook Station.
MASSACHUSETTS:	$458,355
Everett	Avco Corp., $458,355, four 50 kilogauss superconducting magnets.
NEW JERSEY:	$40,998
Wayne	General Precision, $40,998, cryoscope.
NEW YORK:	$43,000
Ithaca	Therm Inc., $43,000, compressor rotor and blade assembly.
OHIO:	$302,946
Cleveland	Feldman Brothers Co., $47,970, altitude exhaust and compressed air piping in CE 9B, Engine Research Building. Rubbish Disposal, $37,076, collection and removal of waste.
Lima	Westinghouse Electric Corp., $217,900, research and development to modularize high power inverters and converters.
PENNSYLVANIA:	$27,140
Pittsburgh	Westinghouse Electric Corp., $27,140, fission gas analysis on four government furnished capsules.

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FOR RELEASE: IMMEDIATE

Release 66-60

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Sept. 30 -- Advanced research and technology in support of NASA aerospace programs will highlight a tour and orientation here next week when the National Aeronautics and Space Administration's Lewis Research Center will host top executives from around the U. S.

Occasion is the 1966 NASA-Lewis Inspection, October 4 - 7. Some 1,800 leaders of Congress, government, universities, business and industry are expected to tour the Cleveland Center during the four-day program.

NASA Administrator James E. Webb and Dr. Abe Silverstein, Lewis director, will greet visitors on the first day of the Inspection, followed by a series of "stops" during which key work at Lewis will be explained and demonstrated. Identical programs are planned for each of the four days, with about 450 visitors expected each day.

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In addition to the tour of Lewis facilities, visitors will have an opportunity to view many exhibits representative of NASA work in space, including the Gemini VII spacecraft, a Centaur high-energy rocket vehicle, and models of many scientific spacecraft launched by Lewis-managed vehicles.

Gemini VII is the spacecraft in which Astronauts James Lovell and Frank Borman completed the longest manned mission to date--14 days--in December 1965. The Centaur vehicle, whose development has been directed by the Lewis Research Center, has successfully sent two Surveyor spacecraft on lunar trajectories. Surveyor I, launched last May 30 by an Atlas-Centaur vehicle, recorded the U.S.' first soft-landing on the Moon and subsequently returned to Earth thousands of high-quality, detailed photos of the lunar surface.

The 1966 NASA-Lewis Inspection has been planned to commemorate the Cleveland Center's 25th year as the nation's major laboratory for research in advanced aeronautical and space propulsion, as well as systems for generating electrical power in space. Visitors will hear detailed presentations and at the same time view facilities in which this work is actually being conducted. Major topics to be discussed include: advanced air-breathing engines, materials, basic research, space vehicles, advanced chemical rockets, space power generation and electric propulsion.

This year's inspection will be the first held at Lewis since 1957 when the Center was a part of the National Advisory Committee for Aeronautics, NASA's predecessor agency. The Lewis staff has since grown to almost 5,000 employees, including 1,900 scientists and engineers, located at the main Cleveland facility and at the Plum Brook Station near Sandusy, Ohio.

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NASA LEWIS RESEARCH center

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PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: Tuesday A. M. 's
October 4, 1966

Release 66-61

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Oct. 4 -- One of the nation's newest and most unique research facilities for studying weightlessness will be unveiled publicly for the first time today at the National Aeronautics and Space Administration's Lewis Research Center.

Some 450 visitors will witness a dramatic demonstration in Lewis' 500-foot deep Zero Gravity Research Facility during the first day of the 1966 NASA-Lewis Research Center Inspection. The demonstration, featuring an actual drop of a 1500-lb. test specimen in the vertical research facility, will be repeated during the four-day long Inspection with a different audience each day.

The 1966 Inspection is being hosted by NASA-Lewis to permit representatives of Congress, industry, business, universities and government to view firsthand the results of aerospace research and development taking place at the Cleveland Center. Visitors will tour Lewis facilities where they

- more -

will see and hear demonstrations and presentations concerning advanced aerospace propulsion and systems for generating electrical power in space.

The Zero Gravity Facility, just recently completed, is expected to be a major attraction. The shaft, or drop tower, is the largest such facility in the U.S. for producing weightless conditions encountered in space. Actual free fall distance for specimens undergoing testing is 450 feet.

The basic structure of the facility is a shaft that extends 510 feet below grade. The shaft is lined with an 18-inch thick concrete casing 28 feet in diameter. Inside is a welded steel vacuum chamber 20 feet in diameter.

Five seconds of weightlessness can be produced by releasing the experiment from the top of the shaft. This time is doubled when the experiment is projected upwards from the bottom of the chamber by a Lewis-designed high-pressure accelerator. The experiment then falls free to a decelerator cart, thus traversing the 450-foot distance twice. The facility can handle experiments weighing up to 6000 pounds.

The decelerator cart is unique in itself. It stands 19 feet high, is 12 feet in diameter and weighs over 22 tons. It is retracted when the accelerator is used to propel objects upward, then can be deployed into its retrieval position in four seconds. Inside the device are millions of small spheres of expanded polystyrene, which permit deceleration of an experiment at a controlled rate. Experiments are decelerated at about 30 g's to prevent damage.

A 2500-pound experiment, traveling 176 feet per second, can be brought to a dead stop in about 15 feet of deceleration material. The energy absorbed in such an experiment is comparable to stopping a modern compact automobile traveling at 120 miles per hour in a distance of 15 feet without damage.

During actual testing, air pressure in the shaft is reduced by a vacuum system to that found at an altitude of 50 miles. This eliminates the need to surround experiments with drag shields as used in conventional drop towers.

A typical zero gravity experiment consists of a transparent tank containing test fluids. High-speed motion picture cameras record the fluid's behavior during zero-G operation. Other data such as pressures and temperatures are recorded onboard the experiment or transmitted via telemetry to receiving equipment. Operation of the Zero Gravity Facility is centered in a control room located in the service building where television monotors permit the test director to view all critical areas of the facility during a test.

Primary objective of the new facility is to provide space scientists with more detailed information on the behavior of fluids in a weightless environment. This is a particularly vital area concerning propellant positioning in rocket vehicles coasting in a zero-G condition.

During the past few years, studies of zero-G phenomena have been made in rocket ballistic flights, in aircraft flying brief zero-G parabolas, in other smaller drop towers, such as Lewis' 100-foot facility, and in some actual

test flights by Centaur and Saturn upper stages. But for long-duration space exploration, when rocket vehicles will be required to coast for long periods under weightless conditions, present-day facilities and methods are insufficient.

The advantage of Lewis' new Zero Gravity Facility is that it is ground-based; experiments are controlled, results are readily available, modifications can be made, and the experiments can be repeated many times over.

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News

NASA LEWIS RESEARCH center

21000 BROOKPARK ROAD CLEVELAND, OHIO 44135

PUBLIC INFORMATION OFFICE

PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: IMMEDIATE

Release 66-67

Warren W. Gerber
(res: 631-9105)

SANDUSKY, Ohio, Oct. 12-- When 4035 persons took advantage of the open gate at NASA's Plum Brook Station last Sunday (Oct. 9), they set a new one-day record for the Drive-Through series.

The third and final public Drive-Through for 1966 will be held this Sunday (Oct. 16). Motorists may start the tour anytime between 10:30 a. m. and 2:30 p. m. Eastern (slow) Time. Approximately one hour is needed to cover the 12-mile tour route as marked on a Plum Brook map contained in a brochure given to each motorist at the main gate.

Plum Brook Station, operated by Lewis Research Center for the National Aeronautics and Space Administration, is located on 6000 acres four miles south of Sandusky.

The main gate is near the junction of Columbus and Taylor roads.

- more -

Visitors can take Route 250 to Taylor road, turn west, and drive a mile to the main gate. The Ohio Turnpike crosses Route 250 at Exit 7. Taylor road is six miles north of Exit 7.

Among the many space age research and development facilities which may be viewed by the general public are the nuclear reactor complex, towering rocket engine test stands, cryogenic propellant tank site, liquid hydrogen and fluorine pump sites, Nuclear Rocket Dynamics and Control Facility, High Energy Rocket Engine Research Facility, Spacecraft Propulsion Research facilities, plus dozens of "igloos" - explosive storage structures used by Army Ordnance during World War II -- and, perhaps, some deer and small animals who have made this large wooded research park setting their home.

For the second year, Alan D. Johnson, Plum Brook director, and members of his staff have scheduled three Drive-Through Sundays for the hundreds of people who have requested tours but could not be accommodated because of day-to-day operations of this research center.

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LeRC

FOR RELEASE: IMMEDIATE

Release 66-72

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Nov. 15 -- More than $993,774 in major contracts were awarded during October by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in four states. They are listed alphabetically by state and city.

CALIFORNIA:	$331,395
Mountain View	Vidar Corp., $31,395, three TDVM voltmeters and three scanners.
Sunnyvale	Lockheed Aircraft Corp., $300,000, Agena adaptation, vehicle integration management and systems contractor support (OGO E mission).
NEW YORK:	$217,330
Buffalo	Bell Aerospace Corp., $184,040, program of analysis, design and fabrication to investigate new methods of regenerative thrust chamber design.

- more -

NEW YORK (Continued):	
Schenectady	General Electric Co., $33,290, electric superconducting power supply.
OHIO:	$60,009
Akron	Goodyear Aerospace Corp., $60,009, design drawings and structural analysis of an air cooled jet engine plug nozzle.
WISCONSIN:	$385,040
Cudahy	Ladish Co., $385,040, large rolled ring-forgings of 200 grade maraging steel.

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FOR RELEASE: IMMEDIATE

Release 66-76

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Dec. 6 -- Second in a series of conferences on management techniques, sponsored by the recently formed Cleveland Federal Executives Board, will be held at NASA's Lewis Research Center on Thursday, December 8.

The "Conference on Improving Managerial and Supervisory Competence" will begin at 10 a.m. with a panel discussion and conclude with a luncheon and address by a Lewis official, followed by a tour of the Lewis Center.

Three industry representatives will appear on the panel. They are Miss Marion S. Kellogg, Manager, Individual Development Methods Service, General Electric Co., New York; Maxwell V. Brown, assistant vice president of the Ohio Bell Telephone Co., Cleveland; and George Shusta, Jr., assistant vice president and training director for National City Bank, Cleveland.

About 200 representatives of federal agencies located in Cleveland are expected to attend.

- more -

Following the panel discussion and luncheon, Bruce T. Lundin, associate director for development at Lewis, will address the group. His presentation is titled "On the Way to the Moon."

The Cleveland Federal Executives Board is one of several such boards established in major metropolitan areas this year by the President. Objectives are to improve the coordination of government activities and to assist the execution of federal programs. The Cleveland board is placing particular emphasis in the areas of general management, public affairs, and programs with interests crossing agency and department lines.

John W. Lehman, who heads the Department of Labor's Office of Labor Statistics in Cleveland, is the current chairman of the Cleveland Federal Executives Board.

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FOR RELEASE: IMMEDIATE

Release 66-80

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Dec. 20 -- More than $1 million in major contracts were awarded during November by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in eight states. They are listed alphabetically by state and city.

CALIFORNIA:	$177,800
Sacramento	Aerojet-General Corp., $177,800, investigation of advanced regenerative thrust chamber designs.
CONNECTICUT:	$231,679
Farmington	United Aircraft Corp., $231,679, inertial sensor hardware components and related services.
ILLINOIS:	$26,837
Chicago	Fansteel Matallurgical Corp., $26,837, columbium 1% zirconium tubing.

- more -

NEW JERSEY:	$83,500
Harrison	RCA, $38,500, a 100 kilogauss 2 1/2 inch bore superconductive magnet.
NEW MEXICO:	$67,168
Holloman	USAF, $67,168, conduct evaluation studies on guidance system components.
NEW YORK:	$30,167
Clarence	Kistler Instrument Corp., $30,167, QUARTZ pressure transducers, helium bleed rocket transducers, extension cable adapters and water cooled adapters.
OHIO:	$400,660
Cleveland	Central Contractors, $400,660, construction of Space Power Research Laboratory.
PENNSYLVANIA:	$89,975
Hatfield	Brooks Instrument Co., $89,975, flowmeter calibration system.

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FOR RELEASE: IMMEDIATE

Release 66-81

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Dec. 20 -- Thirty-nine employees of the Lewis Research Center have been honored for sustained superior performances.

Monetary awards were presented to 34 employees at NASA-Lewis in Cleveland and 5 at Lewis' Plum Brook Station near Sandusky. The awards are made to employees whose performance of their duties and assignments has been determined as superior in all major aspects for a period of at least six months.

Dr. Abe Silverstein, Lewis director, presented the awards in Cleveland. Eugene J. Manganiello, deputy director, made the presentation to Plum Brook employees. Both noted that it is the "devoted, superior

- more -

performance by Lewis employees which enables the center to make important progress in its assigned mission."

Receiving awards were:

	HOME TOWN
John Auerbach	Olmsted Falls
Wilhelm W. Benz	Norwalk
Charles B. Blankenship	Rocky River
Mary G. Brady	Strongsville
Robert O. Brown	Bellevue
Augustine P. Delaney	North Olmsted
Burdell L. Detterman	Elyria
Clarence G. Gettelman	Westlake
Richard P. Geye	Cleveland
Charles F. Gilbert	Lakewood
Walter W. Gliebe	Parma Heights
Frank J. Gusik	Parma
Harold J. Gustin	Cleveland
Martha Hacherian	Cleveland Heights
Gene C. Hunter	Parma
Evert B. Hurst	Middleburg Heights
Eldred H. Johnson	Cleveland
Eugene M. Krawczonek	Brecksville
Franklin J. Kutina, Jr.	Chagrin Falls
Earl W. Lear	Huron
Keith A. Lemley	Brooklyn
Donald C. Lewis	Bay Village
Lawrence P. Ludwig	Fairview Park
Clarence Mamere	Berea
Jack G. McArdle	North Olmsted
David A. Mikol	Cleveland
Johnnie D. Miller	Sandusky
Richard C. Myers	Norwalk

Michael Mytrysak	Rocky River
Thomas J. Ocilka	Parma
Joseph P. Olsavsky	Parma
Stephen J. Posta	Parma Heights
Gary D. Sandrock	Cleveland
James D. Swiers	Cleveland
Jerrold D. Wear	North Olmsted
Paul R. Wieber	Berea
Paul C. Winslow, Jr.	North Olmsted
Harold E. Zager	Parma Heights
Francis J. Zubricky	North Olmsted

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LeRC

FOR RELEASE: IMMEDIATE

Release 67-1

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Jan. 7 -- NASA's Lewis Research Center closed out 1966 with a record of solid accomplishments in its mission to advance aerospace propulsion and power generation technology.

Significant progress achieved by the Center in 1966 included:

--Lewis-managed launch vehicles (Atlas-Centaur, Atlas-Agena and the Thrust-Augmented Thor-Agena) were successful in 10 of 11 launch attempts.

--The most powerful rocket engine ever developed was successfully test-fired.

--An electric thrustor was test-fired continuously for almost six months.

--Lewis' unique 500-foot deep Zero Gravity Research Facility became operational.

- more -

--A new division was organized to direct the Center's work in advanced air breathing propulsion research and development.

The success of Lewis launch vehicles in support of NASA's unmanned lunar exploration program was particularly significant.

On May 30, 1966, the Atlas-Centaur launch vehicle--in its first operational mission--successfully launched the Surveyor I spacecraft from Cape Kennedy. The resulting lunar trajectory was sufficiently accurate so that only a minor midcourse flight adjustment was required to enable Surveyor I to accomplish the U.S.' first soft landing on the Moon. Surveyor I later transmitted several thousand close-up photos of the lunar surface.

A second Surveyor spacecraft was placed on an even more accurate lunar trajectory in September, although the spacecraft failed in its soft-landing mission. A month later, the Centaur upper stage became the first vehicle to reignite high-energy, liquid hydrogen-fueled engines in space. The mission demonstrated that Centaur's propellants could be properly controlled during extended periods of weightless flight.

Atlas-Agena vehicles contributed to the U.S.' intense unmanned exploration of the Moon by placing two Lunar Orbiter photographic

spacecraft in orbit around the Moon. Both the Lunar Orbiter I and II spacecraft returned thousands of detailed, high quality photos of the Moon from their orbits which ranged down to 28 miles above the lunar surface.

An Atlas-Agena also boosted the U.S.' heaviest unmanned spacecraft, the 3900-pound Orbiting Astronomical Observatory, in a mission from Cape Kennedy, as well as an Orbiting Geophysical Observatory and the first of a series of Applications Technology Satellites (ATS). The ATS spacecraft, designed to investigate some of the practical applications of space technology, was one of the U.S.' most complex and successful unmanned missions.

Thrust-Augmented Thor-Agena vehicles were successful in orbiting the Nimbus II weather observation spacecraft and Pageos, the 100-foot diameter passive geodetic satellite which is being used for precise mapping of Earth.

In solid rocketry, the 260-inch diameter motor was test-fired successfully for the second consecutive time. The 130-second test produced a peak thrust of 3.5 million pounds--the most powerful thrust ever developed by a rocket engine.

Success of the 260-inch static firing resulted in the award of a NASA-Lewis contract for $10 million to Aerojet-General Corp. for

fabrication and test firing of a third 260-inch motor expected to produce 5.25 million pounds of thrust. The firing is scheduled to take place in Dade County, Fla., this summer.

In advanced propulsion, scientists successfully fired an electric thrustor in a Lewis vacuum chamber for almost six months, marking a major milestone in the development of long-duration, reliable electric propulsion systems. Later in the year, Electro-Optical Systems, a Lewis contractor, achieved another milestone by testing an electric engine for 341 days of continuous operation.

To further advance the Lewis electric thrustor research technology program, NASA announced two electric engines will be placed in orbit on the SERT II (space electric rocket test) spacecraft to evaluate in-flight performance of the thrustors for periods up to six months or longer. The SERT II mission is scheduled for late 1968.

To continue and advance ground-based studies of fluid behavior under weightless conditions, Lewis completed its unique 500-foot deep Zero Gravity Research Facility. The test facility, a 20-foot diameter, concrete-lined shaft, provides up to 10 seconds of weightlessness for controlled research of fluids under zero-g conditions.

Supplementing the work of the Zero Gravity Research Facility in

1966 was the WASP (weightless analysis sounding probe) rocket which was launched from NASA's Wallops Island, Va., facility. The WASP experiment, developed by Lewis, carried a model of a liquid hydrogen fuel tank. Television cameras viewed and recorded the fluid's behavior during the ballistic flight.

The WASP mission and the successful reignition of liquid hydrogen during the Centaur vehicle test flight were instrumental in showing how high-energy propellants reacted during coasting phases of rocket flight.

Early in 1966, a new Air Breathing Engine Division was organized to direct the Center's efforts toward developing technology needed for aircraft of the future. Major advances in materials, component design, and cooling methods are needed to build propulsion systems for supersonic transports, giant subsonic carriers, vertical takeoff and landing aircraft and advanced military aircraft. Lewis' program in air breathing propulsion is designed to contribute to the technological needs of all of these aircraft.

One of the major problems confronting designers of engines for advanced aircraft is heat. The higher operating temperatures of the advanced air breathing engines mean that many present materials will not work at all and others would have greatly shortened lifetimes. Lewis has launched a two-pronged research attack on the heat problem.

A major effort is underway to develop new materials capable of operating at the higher temperatures. As the temperature goes up, so does the rate of oxidation of most alloys. One research area at Lewis is concerned with improving the oxidation resistance of nickel base superalloys. Comparing one new Lewis alloy with two alloys in use in engines today, the Lewis alloy has twice the oxidation resistance at 1900 degress F. of the nickel base cast alloy MaR-M-200 and ten times that of the nickel base sheet alloy Rene 41.

In the turbine area, new methods for flowing cooling air through the turbine blades are being studied. Impingement cooling is one method for cooling the leading edge of the turbine blade. This internal cooling system uses jets of air to cool the blade's leading edge which has the greatest amount of heat input. Film cooling methods are being studied for the trailing edge of the blade where it is difficult to locate internal cooling passages.

Advanced inlets and nozzles in various experimental configurations are being studied and will be tested in supersonic flight on an F-106B jet aircraft capable of speeds in excess of twice the speed of sound. The F-106B work will augment research being conducted in Lewis wind tunnels.

Other Lewis engineers in the air breathing propulsion field are at work improving bearings and seals, compressors and lubricants, and

studying combustion and special fuels.

A jet engine noise group has made good progress in reducing the noise level associated with fan jet engines.

In the space power generation field, steady progress was made throughout the year toward meeting current and future requirements for lightweight, reliable power systems for spacecraft and satellites.

A new "super blue" silicon solar cell which will have a lifetime in space three times longer than presently available cells was announced in 1966 by Lewis.

The silicon solar cell is at present the most common source of electrical power for spacecraft. However, since these solar cells are made from thin slices of silicon crystals, they are quite brittle. To reduce the cost, weight, and complexity of these solar cell arrays, Lewis has been pursuing a program to develop thin film solar cells which would be larger, very flexible, and lighter in weight. Work during the year resulted in increasingly better efficiencies for thin film cells and construction of the first large thin film solar cell array.

In thermionics, a method of producing electricity by boiling electrons off of a metal emitter at extremely high temperatures, work ranged from development of nuclear fuel fabrication techniques to irradiation of fuels

and insulators in the Lewis Plum Brook Reactor.

One program established the compatibility of tungsten with all nuclear fuels of interest. Techniques for making cylindrical fuel forms and vapor deposition of tungsten emitters have been developed also.

Rotating machinery will probably be used for producing the hundreds to thousands of kilowatts necessary for the complex space missions of the future. Appropriate systems are turbines driven by hot, high pressure gas (Brayton cycle) or by high temperature vapor (Ranking cycle). To be successful in space applications, both methods require large advances in the technology of pumps, turbines, bearings, heat exchangers, and radiators.

During the year extensive testing of components and materials was conducted in Lewis and contractor facilities.

A specific effort in the Rankine power system has been development of the SNAP-8, 35 kilowatt nuclear system. SNAP-8 (System for Nuclear Auxiliary Power) is being developed under the direction of both NASA and the Atomic Energy Commission. Lewis is directing the development of the power conversion system, while the AEC has responsibility for the reactor.

To date, all SNAP-8 power conversion components have met performance requirements with the exception of the turbine. The turbine,

which runs on mercury vapor, has experienced severe materials problems. During the past year a new turbine mechanical and aerodynamic design was worked out by Lewis and its contractor, Aerojet-General. The next turbine, scheduled for early 1967, is expected to approach the desired 10,000 hour design life level.

Brayton cycle systems are attractive for use with either a nuclear heat source or a solar mirror heat source. Techniques for fabricating a lightweight, rigid solar mirror were worked out during the past year and a 20-foot mirror was constructed. A Brayton system using a solar mirror 20 to 30 feet in diameter would produce from 5 to 10 kilowatts of electrical power over long periods of time.

In other areas, advances during the year ranged from development of a tungsten-hafnium alloy that has the highest hot strength of any known metallic alloy to formulation of a new theory on the formulation of metal alloys for ball bearings, seals, gears and cams.

At 3500 degrees F., the hafnium-tungsten alloy has six times the tensile strength of pure tungsten.

The new bearing alloys developed are expected to find application in devices ranging from spacecraft to artificial hip joints.

Lewis' Plum Brook Station, located near Sandusky, Ohio, also made considerable progress during 1966 in work involving its 60,000 kilowatt

nuclear reactor and test programs of rocket engine systems, components, and high energy fuels.

The Plum Brook reactor, which is used in basic research associated with the U.S.' efforts to develop a nuclear rocket, completed its 50th operating cycle in mid-1966 three years after the reactor first reached full power. One of the interesting investigations going on in the reactor is determination of the effect of the combination of radiation and liquid hydrogen temperatures (-420 degrees F.) on materials to be used in nuclear rocket engines.

Large test stands are also being used at Plum Brook to gain a better understanding of nuclear rocketry. Two of the stands are used to flow liquid hydrogen through components and complete unfueled nuclear rocket engines. A series of tests in these Plum Brook facilities first verified the bootstrap capability of a NERVA (Nuclear Engine for Rocket Vehicle Applications) type rocket engine.

Foremost among current Lewis construction projects is the giant $25 million Space Propulsion Facility being built at Plum Brook. When operational, the facility will permit the testing of full size nuclear space power generation systems such as SNAP-8.

One measure of the productivity of a basic research laboratory such as Lewis is the number of reports and patents. During 1966 Lewis engineers were awarded a total of 24 patents and filed applications for 20 additional ones. Lewis engineers and scientists authored 425 technical publications during the year. An additional 523 reports were published by contractors working under Lewis direction.

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PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: WEDNESDAY
JANUARY 11, 1967

Release 67-2

Joann T. Temple
(res: 777-0865)

CLEVELAND, Ohio, Jan. 11 -- Engineers at the National Aeronautics and Space Administration's Lewis Research Center and medical researchers at Cleveland's St. Vincent Charity Hospital have meshed their talents to develop heart valve surgery from a last-ditch effort to a near-routine operation.

St. Vincent's has been a leader in openheart surgery for more than a decade. "The status today of valve surgery is such that it should no longer be a last resort attempt at life saving, but is employed as a corrective measure when significant evidence of valve disease exists," according to Dr. Earle B. Kay of St. Vincent's.

The St. Vincent-NASA program began when a NASA-Lewis employee was admitted to the hospital to have an artificial valve installed in his own

- more -

heart. He overheard discussions of the difficulties of measuring flow and pressures through heart valves and recognized the similarities between this medical problem and aerospace engineering where flows and pressures must often be monitored and controlled from remote locations.

NASA consultation and assistance in the artificial heart valve work is primarily in the instrumentation and controls area. Lewis propulsion engineers applied aerospace technology to St. Vincent's medical problem and designed a controller to drive a mechanical heart assist pump in synchronism with the heart's normal rhythm.

The actual device is called a heart ventricular assist and discriminator. It is really a heart assist pump to take over some of the work of a damaged heart until it can heal itself. It could be used, for example, to speed a patient's recovery after openheart surgery. To assist properly, the pump must follow the beats of the heart it is helping. Thus, a serious control problem arises in the requirement for instantaneous mechanical response to the low-level heartbeat signal.

The controller for the heart assist pump was designed by a Lewis engineer, Vernon D. Gebben. It solves not only the heart control problem, but also has future application in industrial processes and controls.

The NASA device uses electrical signals from the patient's own heart

to control the pneumatic power delivered to the heart assist pump. Thus, high response speed is needed in the circuit. A standard commercial relay switches a fluid amplifier which in turn drives a mechanical valve. The high-speed relay operates on 1/4 milliwatt of electrical power.

Gebben explains, "Increased reliability results from a simplified low power electronic circuit and fluid amplifiers that operate without moving mechanical parts."

The low electrical power required to operate this relay valve should be useful in industrial control. For example, low input power levels would permit direct connection to digital computer outputs with no additional electronics requirement. The high power output from the mechanical valve could then be used to operate pneumatic motors and manipulate actuators. That is, a control system could be run directly from a digital computer output.

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FOR RELEASE: IMMEDIATE

Release 67-3

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Jan. 13 -- More than $900,000 in major contracts were awarded during December by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in seven states. They are listed alphabetically by state and city.

CALIFORNIA:	$384,539
Mountain View	Vidar Corp., $36,275, record and calibration system.
Redondo Beach	TRW, Inc., $48,264, study of post-wrinkling strength of Atlas and Centaur cylindrical skins.
Sunnyvale	Lockheed Aircraft Corp., $300,000, Agena adaptation, vehicle integration management and systems contractor support (Nimbus B).
MASSACHUSETTS:	$156,622
Medford	Meolco (USA), Inc., $49,628, electron microscope.
Waltham	Parametrics, Inc., $106,994, ultrasonic gas temperature measuring system.

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OHIO:	$194,076
Cleveland	Clevite Corp., $194,076, thin film solar cell development.
PENNSYLVANIA:	$41,200
Bethlehem	Gardner Cryogenics Corp., $41,200, design and fabrication and installation of an LH_2 transfer system at Gas Handling Facility at Plum Brook Station.
TENNESSEE:	$89,000
Oak Ridge	Atomic Energy Commission, $89,000, materials to fill receiver tubes.
UTAH:	$32,980
Riverton	Larsen Rigging & Equipment Co., $32,980, dismantle, crate and load for shipment, equipment at Lowry AFB Missile Site.
WISCONSIN:	$26,655
Appleton	Miller Electric, $26,655, arc welder and rheostats.

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FOR RELEASE: IMMEDIATE

Release 67-4

Lynn Manley
(res: 243-3489)

CLEVELAND, Ohio, Jan. 24 -- Two engineers from NASA's Lewis Research Center here have been named to receive the 1967 Goddard Award for work a decade ago which led to the development of the transonic compressor for jet-powered aircraft.

Irving A. Johnsen and Seymour Lieblein of the Lewis staff will share the major aerospace award with Robert O. Bullock, formerly of the Lewis Center who is now employed in private industry.

The award will be presented tonight (January 24) in New York at the American Institute of Aeronautics and Astronautics' fifth Aerospace Sciences Meeting. The three recipients will share a $10,000 honorarium presented by United Aircraft Co. They also will receive individual medals donated by Mrs. Robert H. Goddard, widow of the famed American rocket pioneer. The award was established in 1965 in honor of the late Dr. Goddard.

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The Goddard Medal citation reads: "for long term and continuous contributions in the field of compressor research and design culminating in development of the transonic compressor with directly resultant significant advancement in the state of the art of aircraft jet propulsion."

Johnsen, who joined the Lewis staff in 1943 from NASA's Langley Research Center in Virginia, now heads Lewis' Chemical Rocket Division. His early work here involved research on components for advanced turbojet engines.

Johnsen is a native of Minnesota and received degrees in aeronautical engineering and business from the University of Minnesota. He and his wife, Jessie, reside in Westlake with their two children.

Lieblein has worked at Lewis since 1944, specializing in compressor research for jet engines during his early career. In 1957 he received the NACA Exceptional Service Medal for contributions to development of the transonic compressor. He presently is chief of Lewis' V/STOL (vertical short takeoff and landing) Engine Branch.

A native of New York, Lieblein received B.S. and M.S. degrees in mechanical and aeronautical engineering from City College of New York and Case Institute of Technology, respectively. He resides in Fairview Park.

Bullock worked at Lewis from 1943 to 1957. He presently is employed with the AiResearch Corp. in Arizona.

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LRC

FOR RELEASE: IMMEDIATE

Release 67-8

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Feb. 14 -- More than $6.2 million in major contracts were awarded during January by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in seven states. They are listed alphabetically by state and city.

CALIFORNIA:	$3,500,000
San Diego	General Dynamics Corp., $3,500,000, launch and combined systems testing services (Atlas/ Centaur).
CONNECTICUT:	$122,743
E. Hartford	United Aircraft Corp., $29,443, turbine vanes and blades.
Plainville	Tri-D Corp., $39,500, compressor rotor and blade assembly.
Spring Lane	New England Aircraft Products Co., $53,800, compressor rotor and blade assembly.

- more -

FLORIDA:	$2,051,500
St. Petersburg	Honeywell, Inc., $2,051,500, guidance systems for Centaur flight vehicle.
KENTUCKY:	$139,500
Paducah	U.S. Atomic Energy Commission, $139,500, one calibration system for strain gage pressure transducers.
MASSACHUSETTS:	$124,118
Acorn Park	Arthur D. Little, Inc., $64,735, advanced studies on multi-layer insulation.
W. Concord	Whittaker Corp., $59,383, fabrication and optimization program for producing stainless steel clad tantalum tubing.
NEW YORK:	$173,661
Clarence	Kistler Instrument Corp., $39,911, transducers.
Latham	Mechanical Technology Inc., $133,750, research and development of high temperature gas bearings.
OHIO:	$75,931
Cleveland	Parker Hannifin Corp., $42,571, stainless steel tube fittings.
Willowick	Cleveland Tool and Die Co., $33,360, eight injector parts.
TENNESSEE:	$35,810
Oak Ridge	Oak Ridge Tech. Ent., $35,810, scattering chamber.

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FOR RELEASE: IMMEDIATE

Release 67-9

Hugh W. Harris
(res: 777-2228)

SANDUSKY, Ohio, Feb. 13 -- NASA awards honoring a total of 25 years of accident free driving while on the job have been presented to five men by the Lewis Research Center's Plum Brook Station.

Commendation certificates and Safe Driving Award pins were given to the men by Harry L. Hoover, Chief of the Facilities Service Division at Plum Brook. The awards are made in two categories: vehicle operation which includes cars, carryalls and trucks; and equipment operation which includes cranes, bulldozers, and rollers.

To be eligible for a safe driving award a driver or equipment operator must spend at least 50 to 75 per cent of his time driving and not be involved in a chargeable accident.

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Name	Address	Number of years he has won award
VEHICLE OPERATOR		
George Yonek	Milan Rd., Sandusky	7
P. Joseph Fox	Box 121, North Fairfield	6
Glenn A. Wasen	3608 Matthes Ave., Sandusky	2
EQUIPMENT OPERATOR		
Edward F. Sheridan	26 Vernon Rd., Shelby	5
James W. Sheridan	49 Roberts Dr., Shelby	5

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FOR RELEASE: IMMEDIATE

Release 67-12

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, March 17 -- More than $15.5 million in major contracts were awarded during February by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in seven states. They are listed alphabetically by state and city.

CALIFORNIA:	$11,680,648
Palo Alto	Varian Associates, $40,350, spectrometer system.
Pasadena	Electro-Optical Systems, Inc., $187,677, design, development, fabrication, testing and delivery of hot wire emissive probes.
Redondo Beach	TRW, Inc., $750,000, Centaur launch vehicle guidance evaluations and analyses.
Sacramento	Aerojet-General, $297,621, development of a valid transient performance prediction method for low speed inducer/high speed inducer system coupled hydraulically by a full admission, full flow turbine.

- more -

San Diego	General Dynamics Corp., $10,000,000, management and engineering services in support of Centaur program for CY 1967.
Santa Rosa	Fluor Products Co., Inc., $405,000, furnishing and erecting a water cooling tower at Lewis.
FLORIDA:	$2,357,864
St. Petersburg	Honeywell, Inc., $2,357,864, management and technical capabilities for calendar year 1967.
ILLINOIS:	$93,300
Chicago	IIT Research Institute, $93,300, thermal fatigue testing of high-temperature alloys utilizing the fluidized-bed technique.
KENTUCKY:	$86,358
Paducah	U.S. Atomic Energy Commission, $30,249, thrust measuring bed and hangar assemblies exhaust duct and rear bulkhead assembly. U.S. Atomic Energy Commission, $56,109, engine components for use in turbine blade cooling tests.
MARYLAND:	$65,000
Silver Spring	Naval Ordnance Lab., $65,000, research and development measurement of temperature, pressure and spectral coefficient of hydrogen gas.
MASSACHUSETTS:	$845,000
Cambridge	Controls for Radiation, Inc., $845,000, services incident to operation of Plum Brook nuclear reactor and other administrative services.
NEW YORK:	$91,539
New York	Kawecki Chemical Co., $91,539, fabrication optimization program for producing stainless steel clad tantalum tubing.

- more -

OHIO:	$318,186
Akron	Akron Steel Fabricators Co., $39,790, heat exchanger assembly.
Cleveland	Cleveland Coppersmithing Works, $34,889, fabrication of one new and repair of one inter-cooler tube nest.
Columbus	Battelle Memorial Institute, $44,732, study of creep of Thoria dispersion strengthened nickel with substitutional alloy additions.
Sandusky	Universal Electric Inc., $198,775, construction of data acquisition and detection system for the Spacecraft Propulsion Facility at Plum Brook.

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FOR RELEASE: IMMEDIATE

Release 67-19

Joann T. Temple
(res: 777-0865)

CLEVELAND, Ohio, April 14 -- The International Cryogenic Conference in Kyoto, Japan, this week will hear an Ohio scientist describe magnetics research underway at the National Aeronautics and Space Administration's Lewis Research Center.

James C. Laurence, Chief of the Magnetics and Cryophysics Branch at Lewis, will discuss the large-volume, high-strength magnets used at Lewis for research on advanced space power and propulsion. These magnets are also used for solid-state, plasma and low-temperature physics research.

Possible space requirements for strong magnetic fields include magnetohydrodynamic power generation, thermonuclear power generation and propulsion. One of the many possible future civilian extrapolations of research on cryogenic and superconducting devices would be reducing the cost of electric power transmission.

- more -

Superconducting materials lose virtually all electrical resistance at temperatures near absolute zero (-460°F.). Using superconductors in electrical and magnetic devices could substantially reduce their size and, perhaps more important, their power consumption.

One experimental magnet which Laurence will describe is designed to produce a 15-tesla magnetic field (about 300,000 times that of the Earth) across a bore almost 6 inches wide. To produce a magnetic field of this magnitude in a conventional, water-cooled magnet would require many megawatts of power. Such fields are possible, however, using the unique characteristics of superconductors. The continuous cooling problem is resolved at Lewis by a large and efficient helium recovery and liquification system which provides sufficient liquid helium for cooling purposes.

Laurence concludes that this magnet and the others now used "are all examples of the type of low-cost magnetic-field equipment which has been made possible by the advent of high-field superconductive materials and the consequent elimination of the high-cost power supply and cooling water supply required by conventional copper magnets."

Laurence received both his B.A. and M.A. in physics from Akron University. Throughout his 23-year career in NACA-NASA research, Laurence has specialized in aerodynamics, noise and instrumentation, and magnetics and low temperature physics.

He resides at 23216 West Road, Westview, Ohio, with his wife, Helen, and their three children.

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FOR RELEASE: IMMEDIATE

Release 67-20

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, April 20 -- More than $3.5 million in major contracts were awarded during March by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in seven states. They are listed alphabetically by state and city.

CALIFORNIA:	$371,809
Fullerton	Beckman Instruments, Inc., $59,000, a combustion gas analysis system.
Malibu	Hughes Aircraft Co., $197,220, discharge chamber studies and oxide cathode research for mercury bombardment ion thrustors.
San Diego	International Harvester Co., $115,589, evaluation of silicode coatings for tantalum and columbium alloys.
FLORIDA:	$2,405,848
Gainesville	University of Fla., $30,848, determination of triple point of carbon.
West Palm Beach	United Aircraft Corp., $2,375,000, fabrication and delivery of eleven RL-10-3-3 rocket engines.

- more -

MASSACHUSETTS:	$56, 115
Cambridge	Northern Research & Engineering Co., $56, 115, analysis of geometry and design point performance of high work axial flow turbines.
NEW JERSEY:	$127, 464
Harrison	Radio Corp. of America, $127, 464, development of solar thermoelectric generator design and panel.
OHIO:	$458, 816
Cincinnati	General Electric Co., $134, 369, determination of diaxial creep strength of T-111 tantalum alloy. General Electric Co., $88, 275, primary loop EM pump design program.
Cleveland	TRW, Inc., $83, 865, generation of long-time creep data on refractory alloys. TRW, Inc., $31, 665, test material for generation of creep data. General Electric $92, 000, production of a chromium base alloy into General Mill products.
Columbus	National Electric Coil, $28, 642, 40 magnet parts.
PENNSYLVANIA:	$56, 470
Pittsburgh	Westinghouse Electric Co., $56, 470, determination of the optimum fabrication technique for the production of refractory/austenitic bimetallic tubing.
VIRGINIA:	$49, 926
Springfield	RCA Service Co. ,$49, 926, control data switching system.

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FOR RELEASE: IMMEDIATE

Release 67-30

Joann T. Temple
(res: 777-0865)

CLEVELAND, Ohio, May 26 -- The most powerful field ever produced in a large-bore superconducting magnet was achieved recently at the National Aeronautics and Space Administration's Lewis Research Center.

The NASA magnet produced the 140,000 gauss magnetic field in a large-bore, superconductive solenoid. Such a high field over such a large volume has never been obtained before in either conventional or superconducting magnets.

Although immediate use of such "super" magnets may well be limited to research projects, future broader uses include possible applications to such well developed items as transformers, motors and generators. These

- more -

could be significantly improved by using superconducting materials. Electric power savings could be substantial, and such systems could be reduced in size by factors of 10 to 100.

Superconducting magnets are made of materials with the remarkable property that they lose virtually all electrical resistance at temperatures near absolute zero (-460°F.) There are 23 elements and numerous compounds and alloys which have superconducting properties.

Near absolute zero, internal activity in the atoms of any material is reduced. This allows electrons to pass more easily through the internal lattice structure. Thus, the material presents less resistance to a flow of electrons, or electricity. In the case of a true superconductor, however, the resistance vanishes completely and, once achieved, an electric current can flow as long as the low temperature is maintained.

A conventional electromagnet to produce a field of 140,000 gauss in the same volume would absorb 10,000 kilowatts of electrical power at room temperature operation. A magnet operating at cold cryogenic temperatures around -400° F., would use 1000 kilowatts and a superconducting magnet operating near absolute zero would require less than 1 kilowatt. Power for refrigeration to -453° F. is, of course, necessary.

James C. Laurence, Chief of the Cryophysics and Magnetics Branch at Lewis, explained that NASA interest in superconducting magnet development covers a number of research fields -- plasma propulsion, biomedical

studies, space radiation shielding, high-energy physics, magnetohydrodynamic (MHD) propulsion and power generation, and solid state physics.

The future of superconductivity could include significant changes in present power transmission principles, rotating machinery, instrumentation and communications.

The large superconducting magnet was built for NASA by RCA. In a series of initial tests, the magnet was operated at 100,000 gauss continuously for 62 hours. The magnet winding contained more than 50 miles of superconducting ribbon.

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FOR RELEASE: IMMEDIATE

Release 67-33

Hugh W. Harris
(777-2228)

CLEVELAND, Ohio, June 3 -- A program to advance the technology of Brayton cycle space power generation systems in the range between 2 and 10 kilowatts, is underway at the National Aeronautics and Space Administration's Lewis Research Center.

Such a system would be especially attractive for manned spacecraft and orbiting space stations.

A $2,079,460 contract was recently awarded to the AiResearch Manufacturing Co. of Phoenix, Arizona, for construction of a 2 to 10 kw Brayton cycle compressor, turbine and generator on a single shaft. A Brayton cycle system is similar to an ordinary turbojet engine except it is incorporated in a closed system in which an inert gas is circulated. A liquid silicone coolant circulating through a radiator is used to cool the gas between passes through the engine.

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AiResearch also has a $219,243 contract for fabrication of the Brayton heat exchanger unit. Requests for proposals have been issued for most of the other components such as the D. C. power system for operating the unit and the coolant pump motor assembly.

The Brayton cycle components, to be assembled at Lewis, will be suitable for use with either a solar heat source or a radioisotope heat source. Lewis has already developed fabrication techniques for large rigid solar mirrors to concentrate the sun's rays.

The Atomic Energy Commission has agreed to provide a radioisotope heat source containing plutonium 238 for tests of the Brayton unit. The tests with plutonium 238 will start in 1971 in Lewis' Space Propulsion Facility now being constructed at the Center's Plum Brook Station near Sandusky, Ohio.

The new facility contains a 100 by 120 foot space chamber that is shielded and includes other safety features to allow testing nuclear power systems and complete spacecraft.

The radioisotope heat source would be housed in a ground version of a reentry capsule which is designed to provide information which would allow it to be brought back to earth either aboard the spacecraft or to reenter by itself without hazard to populated areas.

The compatibility of the Brayton system with a solar heat source will be investigated in the Space Propulsion Facility during the period before

the radioisotope heat source is made available. A 30-foot solar mirror will be used. This is the size mirror which would be used for most actual space missions.

If all tests are successful, it is expected that a development program would result to build a Brayton system suitable for space flights.

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FOR RELEASE: IMMEDIATE

Release 67-36

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, June 13 -- School is out for most, but education still continues for 22 university faculty members participating in a summer fellowship program at the National Aeronautics and Space Administration's Lewis Research Center.

This is the fourth year for the program, sponsored jointly by the Lewis Research Center and Case Institute of Technology under the auspices of NASA and the American Society of Electrical Engineers.

The participants, mostly assistant and associate professors of science and engineering, are selected from universities throughout the country. During their ten-week period here, they will do research in their areas of interest and attend a series of lectures presented by members of the technical staff at Lewis and other national authorities. They will also attend a program on June 29 at Case, organized by Dr. Edward J. Morgan, who is a co-chairman of the program.

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Dr. Walter T. Olson, co-chairman for Lewis and its assistant director, said that "the fellowships stem from NASA's recognition that the nature and success of the nation's aerospace program is intimately related to the background, imagination and creativity of the nation's engineers."

The objectives of the program, Olson said, are to further the professional knowledge of qualified engineering and science faculty, to stimulate an exchange of ideas between participants and NASA, and to enrich and refresh the research and teaching activities of the participants' institutions.

The Lewis Research Center piloted this fellowship program in 1964 and has had 47 faculty members participate to date. Five other NASA installations now sponsor such a program, each tailored to a different field of interest. These include the Manned Spacecraft Center, Houston, Tex.; Goddard Space Flight Center, Greenbelt, Md.; Marshall Space Flight Center, Huntsville, Ala.; Ames Research Center, Moffett Field, Calif.; and Langley Research Center, Hampton, Va.

- more -

This summer's participants in the fellowship program at Lewis are as follows:

Dr. Kenneth H. Adams
Assistant Professor
Dept. of Mechanical Engineering
Tulane University
New Orleans, Louisiana 70118

Dr. William L. Boeck
Assistant Professor
Dept. of Physics
Niagara University
Niagara University, New York 14109

Dr. Theodore G. Brna
Assistant Professor
Dept. of Mechanical Engineering
Virginia Polytechnical Institute
Blacksburgh, Virginia 24061

Mr. Michael Bubel
Assistant Professor
Dept. of Electrical Engineering
Buckness University
Lewisburg, Pennsylvania 17837

Dr. Leon J. Buteau, Jr.
Associate Professor
Mechanical Engineering Dept.
Newark College of Engineering
323 High Street
Newark, New Jersey 07102

Dr. Shee-Ming Chen
Assistant Professor
Dept. of Electrical Engineering
City College of the City University
of New York
New York, New York 10031

Dr. Thomas A. DeMassa
Assistant Professor
Electrical Engineering Dept.
Arizona State University
Tempe, Arizona 85281

Dr. Roger E. Eckert
Associate Professor
Chemical Engineering
Purdue University
West Lafayette, Indiana 47906

Dr. Andrew J. Eggenberger
Assistant Professor
Engineering
University of South Carolina
Columbia, South Carolina 29208

Dr. Wilbur M. Franklin
Assistant Professor
Physics Department
Kent State University
Kent, Ohio 44240

Dr. Edward Gelerinter
Assistant Professor
Physics Department
Kent State University
Kent, Ohio 44240

Dr. Jon D. Hutchison
Assistant Professor
Chemistry Department
University of Tulsa
1133 N. Lewis
Tulsa, Oklahoma 74104

Mr. Bruce E. Johansen
Instructor, Physics Department
Cleveland State University
Euclid Avenue at 24 Street
Cleveland, Ohio 44115

Mr. David L. Johnson
Assistant Professor
Physics Department
Kent State University
Kent, Ohio 44240

- more -

Dr. Chaim Z. Kamien
Associate Professor
Mechanical Engineering Dept.
Lowell Technological Institute
Lowell, Massachusetts 01854

Mr. Lowell E. Lingo
Supervisor, Network Analyzer Laboratory
Electrical Engineering Department
Syracuse University
117 Hinds Hall
Syracuse, New York 13210

Dr. Milton Ohring
Assistant Professor
Metallurgy
Stevens Institute of Technology
Hoboken, New Jersey 07030

Dr. James E. Poth
Assistant Professor
Department of Physics
Miami University
Oxford, Ohio 45056

Dr. Clarence W. Schultz
Associate Professor
Electrical Engineering Dept.
University of Connecticut
U-37
Storrs, Connecticut 06268

Dr. Thomas B. Swearingen
Assistant Professor
Mechanical Engineering Dept.
Kansas State University
Manhattan, Kansas 66504

Mr. Byron E. Thinger
Assistant Professor
Department of Engineering
San Francisco State College
1600 Holloway Avenue
San Francisco, California 94132

Dr. Kenneth Wark, Jr.
Associate Professor
Mechanical Engineering Dept.
Purdue University
Lafayette, Indiana 47907

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FOR RELEASE: IMMEDIATE

Release 67-44

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, June 29 -- Thirty-seven employees of the National Aeronautics and Space Administration's Lewis Research Center have received commendations for sustained superior performance for six months or longer.

Monetary awards ranging from $150 to $800 were presented on June 27 to 28 employees at NASA-Lewis in Cleveland by Dr. Abe Silverstein, Director. Awards were presented on June 26 to nine employees at Lewis' Plum Brook Station near Sandusky by Alan D. Johnson, Plum Brook Director.

The awards recognized employees whose performance of their duties and assignments has been determined as superior in all major aspects for a period of six months or more.

All NASA employees are eligible for the awards which are presented under the authority of the Government Employees Incentive Awards Act.

- more -

Receiving awards were:

AVON LAKE

Donald H. Sinclair	251 Vineyard Road

BAY VILLAGE

Marvin W. Tiefermann	27012 Bruce Road

BEREA

Loren W. Acker	104 French Street
William B. Conley	292 Frowles Road
Alex Pucci	243 Stanmay Drive

BROOKLYN

Danny Rusyniak	9401 Morton Avenue

BRUNSWICK

Kefton Donley	1199 Sterns Street

CASTALIA

Roger K. Hershiser	5116 Rockwood Drive

CLEVELAND

Gale E. Butler	3413 E. 146 Street
Joseph D. Cenzori	9303 Morton Avenue
William T. Crooks	15902 Galemore Drive
Leo F. Doubler	3776 W. 137 Street
Melvin M. Ferencik	13435 Kathleen Drive
Bernard J. Kubrak	13612 Bennington Avenue
Albert Sbeghen	4736 Ridge Road

CUYAHOGA FALLS

Martin J. Braun	2763 Eleventh Street

ELYRIA

Elmer E. Botos	211 Belmont Avenue

FAIRVIEW PARK

Jack C. Humphrey	5840 West 215 Street

LAKEWOOD

David E. Ross	1493 Lauderdale
Leslie J. Smith	18725 Detroit Road - Apt. 602

LORAIN

Leo F. Theobald	2441 Lincoln Drive

MILAN

Robert F. Rockwell	23 W. Front Street

NEW WASHINGTON

Robert P. Kanney	403 Foote Street

NORTH OLMSTED

Richard T. Gedney	6393 Stafford Drive
Herbert E. Schmidt	23540 David Drive - Apt. 118-C
Harold W. Schmidt	6681 Cyprus Drive

- more -

NORTHFIELD

Vincent R. Lalli	11846 Dunham Road
Arthur D. Smith	7595 Morningside Drive

NORWALK

Robert W. Simons	31 Parsons Street

OLMSTED FALLS

Gene L. Hoss	8634 Stearns Road

PARMA

Edward A. Werner	5502 Southington Drive

ROCKY RIVER

John P. Wanhainen	21891 Erie Road

SANDUSKY

Thorvald W. Brink	402 Boston Road
William D. Collins	1125 Campbell Street
Manuel P. Narcizo, Jr.	308 Gildona Drive

SHELBY

Harold L. Ross	116 West Smiley

WESTLAKE

Russell A. Lindberg	27729 Hollywood Drive

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FOR RELEASE: IMMEDIATE

Release 67-51

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, July 26 -- More than $15.4 million in major contracts were awarded during June by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 17 states, Canada and the District of Columbia. They are listed alphabetically by state and city.

ARIZONA:	$387,133
Phoenix	Garrett Corp., $387,133, potassium turbo-alternator preliminary design.
CALIFORNIA:	$2,168,517
Canoga Park	North American Aviation Inc., $113,100, development of a protective coating system for regeneratively-cooled thrust chambers. North American Aviation Inc., $28,453, design criteria monograph axial flow pumps. North American Aviation Inc., $29,262, design criteria monograph pump inducers. North American Aviation Inc., $32,326, design criteria monograph centrifugal flow pumps.

- more -

CALIFORNIA (Continued)

Hawthorne	Northrop Norair, $240,400, evaluation of concepts to reduce hot-gas ingestion in VTOL lift engines.
Los Angeles	AiResearch Mfg. Co., $73,874, simulated potassium boiler experiments.
Menlo Park	Stanford Research Institute, $51,400, improved oxidation resistance of nickel and cobalt superalloys.
Montebello	Worthington Controls Co., $41,284, electro-hydraulic actuator.
Mountain View	CETEC Corp., $270,000, evaluation of aft-end ignition for solid propellant rocket motors.
Palo Alto	Aerotherm Corp., $100,000, rocket engine ablative material phenomena
Pleasanton	General Electric Co., $273,969, thermionic fuel investigations.
Sacramento	Aerojet-General Corp., $27,543, design criteria monograph for axial flow pumps. Aerojet General Corp., $26,204, design criteria for solid rocket motor cases. Aerojet-General Corp., $155,000, development of an effective reliable liftoff seal for use in advanced turbomachinery. Aerojet-General Corp., $124,840, development of a protective coating system for regeneratively cooled thrust chambers. Aerojet-General Corp., $244,000, investigation of laminated convection-film cooled vanes.
San Gabriel	Heat Engineering & Supply Co., $65,716, design, develop, fabricate, test and deliver parasitic ladd resistor assemblies.
Santa Monica	McDonnell Douglas Corp., $208,940, development and testing of a 5 ampere-hour silver-zinc cell.

CALIFORNIA (Continued)	
Sunnyvale	United Aircraft Corp., $26,622, design criteria monograph for solid propellant processing. Lockheed Aircraft Corp., $35,584, design criteria monograph for solid rocket thrust vector control.
CANADA:	$98,930
Ottawa	Canadian Commercial Corp., $98,930, meteoroid bumper interactions.
COLORADO:	$94,500
Denver	Dow Chemical Co., $94,500, mirror sectors.
CONNECTICUT:	$1,810,119
East Hartford	United Aircraft Corp., $115,118, testing high emittance coatings on platinum 20% rhodium alloy substrate. United Aircraft Corporation, $1,483,354, high loading low-speed fan study and single stage evaluation of highly loaded, high-mach number compressor stages.
Groton	General Dynamics Corp., $241, 947, development of optimum tungsten inert gas welding procedure for production of weldments in 12% nickel maraging steel.
Stanford	Barnes Engineering Co., $51,500, infrared radiometer system for determination of combustor performance.
Storrs	University of Connecticut, $33,318, analytical and experimental studies of an amplifier.
DISTRICT OF COLUMBIA:	$51,675
	Harris Research Lab., $51,675, studies of interfacial surface energies.

FLORIDA:	$1,523,104
West Palm Beach	United Aircraft Corp., $872,000, space storable regenerative cooling investigation. United Aircraft Corp., $651,104, single stage experimental evaluation of slotted rotor and slotted blading.
GEORGIA:	$655,110
Marietta	Lockheed Aircraft Corp., $655,110, performance of cryogenic irradiation testing effort.
ILLINOIS:	$85,850
Chicago	IIT Research Institute, $85,850, ductile cladding alloy development.
MARYLAND:	$2,668,278
Baltimore	Catalyst Research Corp., $205,600, development of a long-life thermal cell.
Germantown	Fairchild Hiller Corp., $2,462,678, development of spacecraft support unit for SERT II mission.
MASSACHUSETTS:	$550,794
Cambridge	Arthur D. Little Inc., $182,950, shadow shield development.
Lowell	AVCO Corp., $28,950, post test analysis of ablative materials.
Maynard	Digital Equipment Corp., $78,464, digital computer.
Waltham	Parametrics, Inc., $99,830, ultrasonic measurement of core material temperature. Thermo Electron Engineering Corp., $63,000, design and fabricate six thermionic converters.
West Concord	Whittaker Corp., $97,600, properties of powdered titanium.

MICHIGAN:	$206,182
Ann Arbor	University of Michigan, $38,340, study of temperature measurements of absorption-emission pyrometry in nonisothermal gases. Easco-Sparcatron, Inc., $28,100, electrical discharge machine.
Madison Heights	Bendix Corp., $139,742, investigation of oxidation resistant porous material for transpiration cooled vanes.
NEW JERSEY:	$35,350
W. Long Branch	Electronics Associates, Inc., $35,350, analog computer.
NEW YORK:	$341,690
Buffalo	Bell Aerospace Corp., $155,000, ignition of oxygen difluoride and LPG's.
Delmar	North Vernon Contractor, Inc., $87,600, operate and maintain steam generating plant.
Tonawanda	Union Carbide Corp., $99,090, development of a turbocompressor gas bearing simulator.
OHIO:	$2,736,156
Bedford	Borg-Warner Corp., $305,564, pump motor inverter assembly for Brayton cycle systems.
Cincinnati	General Electric Co., $441,375, potassium turbo-alternator preliminary design.
Cleveland	Harrington Electric Co., $34,990, remove acoustical ceiling and install new tyrid ceiling in ERB. Joseph T. Ryerson & Son, Inc., $25,920, columbium - 1% zirconium alloy sheet. Advance Asphalt Paving Co., $35,300, miscellaneous paving and concrete work. TRW, Inc., $64,900,

OHIO (C ontinued)

Cleveland (Continued)	carbon dioxide concentration system. Systems Engineering Labs., Inc., $87,590, computer, magnetic tape control and perspheral equipment. Rubbish Systems, $33,600, collect and remove waste material. Suburban Power Piping Corp., $46,000, repair and alterations of steam trench distribution system.
Columbus	Battelle Memorial Institute, $127,830, techniques for fabricating rocket engine components containing intricate flow channels. Battelle Memorial Institute, $161,480, development of a protective coating system for regeneratively-cooled thrust chambers. Scientific Advances, Inc., $40,766, 109 miniature strain gage pressure transducers. Battelle Memorial Institute, $166,500, development of advanced fabrication techniques for regeneratively cooled thrust chambers by the gas pressure bonding process. J.E. Carlin & Sons, $28,350, miscellaneous concrete work.
Lima	Westinghouse Electric Corp., $1,055,757, development of a power conditioner and control system for SERT II flight test.
North Royalton	Central Contractors, $47,984, modification of three rooms in the Electric Propulsion Research Bldg.
Strongsville	The Sachsen Builders Corp., $32,250, repairing brickwork, cleaning and waterproofing various sections of the Engine Research Building.
PENNSYLVANIA:	$934,671
Chester	Sun Shipbuilding & Dry Dock Co., $47,724, development of optimum welding procedure for production of weldments in rolled ring forgings.
Philadelphia	General Electric Co., $52,161, modification of ablative program for ablation in more than one layer.

PENNSYLVANIA (Continued)

Philadelphia (Continued)	General Electric Co., $68,900, analytical and experimental investigation on sidelobe suppression techniques for reflector type spacecraft antennas. Franklin Institute, $44,519, non-linear orbit analysis and computer program for gas-lubricated tilting pad journal bearings.
Pittsburgh	Westinghouse Corp., $59,000 development of arc melting techniques for chromium base alloys. Pittsburgh-Des Moines Steel Co., $223,900, construction of a V/STOL wind tunnel modification of the 8x6 SWT return duct for testing of V/STOL left fans. Westinghouse Electric Corp., $49,150, feasibility study of processes to develop dispersion strengthened chromium alloys. Westinghouse Electric Corp., $80,800, controlled viscosity glass type coatings for superalloys.
Valley Forge	General Electric Co., $307,617, Brayton cycle vapor chamber fin radiator panel.
TEXAS:	$131,207
College Station	Texas A&M University, $26,300, design criteria monograph for propellant grain stress analysis.
Dallas	Texas Instruments, Inc., $49,150, determining the feasibility of chemical vapor deposition process for the production of dispersoid strengthened chromium alloys.
Houston	Texas Instruments, $26,800, recorder.
UTAH:	$496,873
Brigham City	Thiokol Chemical Corp., $267,250, development of low cost ablative nozzles for large solid propellant rocket motors. Thiokol Chemical Corp., $200,000, development of filament wound motor case for solid propellant rocket motors. Thiokol Chemical Corp., $29,623, solid rocket motor thrust control.

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WASHINGTON:	$464,000
Seattle	Boeing Co., $267,500, investigation of beep flaws in thin wall tanks. Boeing Co., $70,000, liquid hydrogen positive expulsion bladders. Boeing Co., $126,500, development of low-cost welding procedure in Hy-150 steel plate.

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PUBLIC INFORMATION OFFICE

PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: IMMEDIATE

Release 67-58

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Aug. 25 -- More than $5.7 million in major contracts were awarded during July by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 11 states. They are listed alphabetically by state and city.

CALIFORNIA:	$2,644,103
Canoga Park	North American Aviation, Inc., $314,296, investigation of inducer dynamics partial flow turbine drive. North American Aviation, Inc., $256,500, space storable regenerative cooling investigation. North American Aviation, Inc., $339,500, program of analysis, design and experimental efforts to develop high performance injectors for space storable propellants.
Huntington	Douglas Aircraft, $249,900, development and demonstration of criteria for liquid fluorine feed system components.

- more -

Redondo Beach	TRW, Inc., $295,855, space storable thrustor investigation. TRW, Inc., $232,100, investigate a high performance injector for space storable propellants.
Redwood City	Ampex Corp., $36,625, magnetic tape recorder.
Sacramento	Aerojet-General Corp., $196,000, fluorine lubricated bearing technology. Aerojet-General Corp., $223,000, development of thermal barrier coating for use on a water cooled nozzle of a solid propellant rocket motor.
San Diego	General Dynamics Corp., $98,972, measurement and analysis of neutron capture cross sections. General Dynamics Corp., $148,814, measurement and analysis of radio frequency noise in urban, suburban and rural areas.
San Leandro	Crane Hoist Engineering & Manufacturing Co., $49,165, traveling bridge crane.
Santa Monica	McDonnel Douglas Corp., $121,678, silver-cadmium cell development and testing.
Sunnyvale	Lockheed Aircraft Corp., $91,698, analytical study of low slosh dynamics in spherical containers.
CONNECTICUT:	$525,783
East Hartford	United Aircraft Corp., $40,019, turbine vanes and blades. United Aircraft Corp., $458,000, quiet engine definition program.
Portland	Klik Industries, $27,764, compressor rotor and blade assembly.
FLORIDA:	$370,120
West Palm Beach	United Aircraft Corp., $370,120, investigation of flight hydrocarbon fuels with fluorine oxygen mixtures as liquid rocket propellants.

- more -

ILLINOIS:	$27,000
Springfield	Simplex Co., Inc., $27,000, Load Banks.
MARYLAND:	$90,503
Middle River	Martin Marietta Corp., $90,503, modification of government-owned thermionic lead capsule TIE 1-3.
MASSACHUSETTS:	$49,199
Waltham	Thermo Electric Engineering, $49,199, cessiated thermionic converters.
MINNESOTA:	$25,025
Minneapolis	Research Controls, Inc., $25,025, programming - power control system.
NEW JERSEY:	$152,569
Paramus	Arde, Inc., $152,569, development of a filament overwrapped cryoformed metal pressure vessel.
NEW YORK:	$569,747
Brooklyn	Camin Laboratories, Inc., $60,000, chambers and nozzles. Camin Laboratories, Inc., $168,760, development of advanced fabrication techniques for generatively cooled thrust chambers by the electroforming process.
Deer Park	Cutler-Hammer, Inc., $290,987, radio frequency noise measurement system.
Hicksville	Sylvania Electric, $50,000, development of ductile cladding for TD nickel turbine vane applications.
OHIO:	$1,130,154
Cincinnati	General Electric Co., $77,500, compressor end seal development and test.

- more -

OHIO (Continued)

Cleveland	Honeywell Inc., $34,863, controllers, indicating potentiometric. TRW, Inc., $148,565, reinforced oxide throat insert development. Roediger Construction, Inc., $81,900, remove deteriorated steel windows and installation of new anodized aluminum windows. PPM, Inc., $119,500, Signal Conditioners.
Columbus	Battelle Memorial Institute, $124,990, study of joining and inspection techniques in the fabrication of air-coded turbine blades. Battelle Memorial Institute, $49,150, determine the feasibility of chemical vapor deposited process for the production of dispersoid strengthened chromium alloys. Battelle Memorial Institute, $174,140, development of advanced fabrication techniques for regeneratively cooled thrust chambers by the explosive bonding process.
Mansfield	R. G. Beer, $82,387, construction of secondary sewage treatment facility at Plum Brook.
Norwalk	Leon Riley Co., $100,159, widen and improve Columbus Avenue at Plum Brook.
Springfield	Eagle Tool & Machine, $137,000, machine forming fixtures.
PENNSYLVANIA:	$93,726
Hazelton	Beryllium Corp., $93,726, beryllium.

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FOR RELEASE: IMMEDIATE
September 16, 1967

Release 67-60

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio -- Three area engineers will be honored Tuesday (September 19) at ceremonies in New York City for developing one of the "100 most significant inventions of the year."

William D. Klopp, Peter L. Raffo and Walter R. Witzke of the National Aeronautics and Space Administration's Lewis Research Center developed the highest strength metal known to man at temperatures above 3500 degrees Fahrenheit. Called Tungsten RHC, the alloy has eight times the tensile strength of pure tungsten at 3500 degrees with no sacrifice in ductility at low temperatures.

The "I-R 100" awards are sponsored by Industrial Research Magazine and presented in observance of National Industrial Research Week. The winning products are selected each year by a special board consisting of 30 leading research scientists, engineers and administrators including several

- more -

Nobel Prize winners. This is the second year in a row that a development at Lewis Research Center has been honored.

Tungsten RHC was developed at Lewis as part of the laboratory's continuing program to advance materials capabilities at both ends of the temperature scale. Tungsten, the highest melting point metal, has long been attractive for high temperature applications. However, it also has several drawbacks. At temperatures below 250 degrees F. it is very brittle and alloying it to increase strength usually makes it more brittle.

Lewis engineers succeeded in combining methods for increasing ductility with the use of hafnium carbide precipitates to increase strength. The hafnium carbide actually pins defects in the crystal structure to inhibit planes of atoms from slipping.

Scientists elsewhere had discovered that the ductility of tungsten could be increased by alloying it with 26 percent rhenium, another rare refractory metal. Lewis engineers demonstrated that the ductility of tungsten sheet could be increased by adding just 2 to 9 percent rhenium if it was prepared with a high purity method such as electron beam melting.

The strengthening and ductilizing methods were combined in Tungsten RHC which has a maximum tensile strength of 75, 400 psi at 3500 degrees F. compared with 9000 psi for pure tungsten and can be bent at temperatures

as low as 175 degrees F. compared with 250 degrees for unalloyed tungsten.

A fourth member of the development team, Lester S. Rubenstein, is now associated with the Atomic Energy Commission in Germantown, Maryland.

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FOR RELEASE: IMMEDIATE

Release 67-71

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, Nov. 3 -- It is a long and bumpy road for those who travel the trades apprenticeship route at NASA's Lewis Research Center.

But it has been a worthwhile trip for a class of 17 aerospace mechanics and experimental facilities electricians who will graduate next week (Nov. 9) and earn their journeymen titles.

The four-year apprentice program is a rigorous one combining on-the-job training with more than 600 hours of related classroom instruction. Since its beginning at the Lewis Research Center in 1949, the Apprentice Training Program has graduated 16 classes. The present class brings the total number of graduates to 588.

Following a welcome and congratulatory remarks by Dr. Abe Silverstein, Director of the Center, the main address will be given by Dan McCarthy,

- more -

representative of the Bureau of Apprenticeship and Training, U.S. Department of Labor, Cleveland. McCarthy, a former apprentice and journeyman bricklayer, will speak to the graduates on the relationship of attitude to successful progress on the job.

Each graduate will receive two certificates in the afternoon ceremonies. One is from the U.S. Department of Labor and NASA (issued jointly), the other from the Ohio State Apprenticeship Council presented by John F. Kostyo, executive secretary of the Ohio State Apprenticeship Council.

The new graduates are:

EXPERIMENTAL FACILITIES ELECTRICIANS

Name	Address	City
Edward J. Bukvic	13909 Lyric Ave.	Cleveland 44111
Frank J. Klemencic	27120 Sprague Rd.	Olmsted Falls
Gerald F. Schneider	145 Armour Drive	Avon Lake

AEROSPACE MECHANICS

Thomas P. Dorony	4311 Gifford Ave.	Cleveland 44109
James T. Herrington	702 W. Broad St.	Elyria
Ralph M. Joyce	3446 W. 150 St.	Cleveland 44111
Thomas Kahoe	3115 W. 84th St.	Cleveland 44102
Raymond Petrime	12606 Bennington	Cleveland 44135
Charles A. Sako	4313 Ardmore	Cleveland 44109
Eugene M. Sarich	12718 Lorain Ave.	Cleveland 44111
William P. Sexton, Jr.	4556 Roadoan Rd.	Cleveland 44109
Walter W. White	Box 32	LaGrange

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FOR RELEASE: 3 P.M., WEDNESDAY
November 29, 1967

Release 67-72

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Nov. 29 -- NASA has awarded a $21,113,688 contract for management and engineering services for the Centaur launch vehicle to General Dynamics/Corporation, San Diego, California.

The cost-plus-award-fee contract is a continuation of the present contract with the company to perform additional work in calendar year 1967 through Sept. 30, 1968.

The Centaur upper stage rocket has been used successfully to launch six Surveyor spacecraft on flights to the Moon. It will continue in use for lunar and planetary as well as earth orbital missions.

Project manager for the Centaur is NASA's Lewis Research Center.

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FOR RELEASE: IMMEDIATE

Release 67-75

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Dec. 21 -- A cobalt-tungsten-iron alloy which has high strength and good magnetic properties in the 1200 to 1400 degree Fahrenheit temperature range has been developed by engineers at the National Aeronautics and Space Administration's Lewis Research Center.

The advance in materials technology is important because normally metals lose their magnetic properties as temperature increases. A number of possible future space systems, particularly for electrical power generation, will require metals which have good magnetic induction and high strength in this temperature range. Here on earth the alloy also has potential for use in electric generators and motors.

Weight is always a problem in space missions. The new Lewis alloy permits generators to operate at higher temperatures which raises the

- more -

efficiency of the power conversion system. The high temperature strength of the alloy makes possible more compact systems. Taken together these features may permit significant weight reductions.

The cobalt-tungsten ferromagnetic alloy was developed in Lewis' Materials and Structures Division under the direction of John C. Freche, Chief of Fatigue and Alloys Research Branch. It contains 88 percent cobalt, 7.5 percent tungsten, 2.5 percent iron, 1 percent titanium, .5 percent zirconium and .5 percent carbon. The development team consisted of Richard L. Ashbrook, Gary D. Sandrock and Robert L. Dreshfield from the Fatigue and Alloys Branch and Anthony C. Hoffman from the Spacecraft Technology Division.

The Lewis team, in the course of developing structural cobalt-tungsten alloys for ducting and radiators for space power systems, observed that the alloys possessed high temperature magnetic properties which would be useful in electrical power conversion components. The metallurgists at Lewis then experimented by modifying the composition of the alloys to achieve the best or optimum, balance of strength and magnetic induction. Magnetic induction is the ability to become strongly magnetized.

A family of cobalt alloys has been developed at Lewis under Freche's direction for high temperature applications. These alloys have good high temperature strength, workability and are less subject to evaporative loss in space than commercially available cobalt base alloys.

To achieve the combination of high temperature strength and high temperature magnetic properties required for generator rotor application one of the superalloys in this series was selected as a starting point. Its composition was 72 percent cobalt, 25 percent tungsten, 1 percent titanium and .5 percent each of zirconium and carbon. In this alloy system tungsten increases high temperature strength but it decreases high temperature magnetic induction. To obtain a balance between these two desired properties, the amount of tungsten was reduced to 7.5 percent and iron added.

Standard induction melting methods are used in the manufacture of the new alloy.

For stresses of interest in the 1200 to 1400 degree F. temperature range, the new alloy in cast form has a stress rupture life approximately 10 times greater than one of the best commercially available magnetic structural alloys. At 1300 degrees F., its stress rupture life is greater than 2000 hours at 40,000 pounds per square inch (psi). Its magnetic induction is comparable to the commercial alloy.

The new NASA alloy can also be rolled into sheet material. In this form its stress rupture life at 1300 degrees F. is greater than 100 hours at 40,000 psi.

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FOR RELEASE: IMMEDIATE

Release 67-78

Hugh W. Harris
(res: 777-2228)

SANDUSKY, Ohio, Dec. 29 -- The National Aeronautics and Space Administration's Lewis Research Center announced today it will cooperate with the Ohio Cooperative Wildlife Research Unit in its plans for a fertility research program aimed at helping to solve the problem of overpopulation of deer at Plum Brook Station near Sandusky, Ohio.

The program is expected to have wide application to national parks and other protected areas throughout the country.

When Plum Brook Station was originally established as an explosives manufacturing facility by the U.S. Army Ordnance Corps in 1942, there was only a handful of deer living on the property. When NASA assumed control in the late 1950's the herd numbered at least 200. Today it is estimated at more than 700.

The Ohio Cooperative Wildlife Research Unit is affiliated with Ohio

- more -

State University. The fertility control project will be conducted by John D. Harder under the direction of Dr. Tony J. Peterle, Professor of Population and Environmental Biology at Ohio State University. The Cooperative Research Unit is supported by the U.S. Department of the Interior, U.S. Fish and Wildlife Service, the Wildlife Management Institute and the Ohio Division of Wildlife.

The Plum Brook Station is ideally suited to the pilot fertility control program because an existing fence divides the reservation into two almost equal areas. This will provide for the necessary control group to judge the effect of the program.

Harder says, "It is also fortunate that the program can be conducted without interfering with the normal space research activities. Because of the nature of the activities at Plum Brook it has not been possible to use the method of controlled hunting such as conducted at the Army's Ravenna Arsenal."

The first step in the program will be to take a sample of deer in several age groups at Plum Brook. These deer will be studied to determine certain endocrine, reproductive and physical characteristics. The venison from the sampling will be donated to the Mansfield Reformatory and other state institutions.

NASA is also cooperating with the Ohio Division of Wildlife project to relocate 100 or more deer from Plum Brook to other areas of the state.

The two projects will complement each other in the effort to solve the problem of overpopulation of deer at Plum Brook.

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FOR RELEASE: IMMEDIATE

Release 67-79

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Dec. 29 -- The atmosphere of the Christmas season with its multicolored lights can be found all year round in the Energy Conversion Laboratory at NASA's Lewis Research Center.

Red, green, blue, and white lights are used in research on thin film solar cells. The studies involve the response of these cells to light of various wave lengths and consequently of various colors. The response is determined by measuring the electrical current produced by the cells.

Recently an interesting phenomena was discovered by researchers. The response of the thin film solar cells to red light was greatly decreased by heat treating. Heat treating is an essential part of the manufacturing process.

They also found the cure. Exposing the cells to green and red light at the same time quickly restored the solar cells response to a normal level. As long as a mixture of light at various wave lengths is used the cells are normal, but their efficiency drops when the light is limited to the red wave lengths.

- more -

Dr. Henry Brandhorst, a scientist at Lewis, explained the problem this way. "The thin film cells have a layer of cadmium sulfide and a layer of cuprous sulfide. During the heat treating process some copper atoms diffuse into the cadmium sulfide. These copper atoms form traps which capture electrons being generated in the cell and prevent them from flowing through the proper circuit. The exposure to green and red light at the same time neutralizes these traps by changing the state of the copper atoms."

Since light coming from the sun contains a mixture of all colors this phenomena presents no problem in using the cells on spacecraft.

Lewis has been working in its own laboratories and with manufacturers for several years to develop thin film solar cells to the point where they will offer an advantage in space over the silicon crystal solar cells used at present. Thin film cells have potential advantages over the crystal cells since they are very light in weight, flexible and inherently resistant.

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FOR RELEASE: IMMEDIATE

Release 68-3

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Jan. 11 -- A $4,521,671 follow-on contract for management and engineering services for the Centaur launch vehicle guidance system has been awarded to Honeywell Inc. of St. Petersburg, Florida by the National Aeronautics and Space Administration.

The cost-plus-award-fee incentive contract will provide for continuing management and engineering support at Honeywell's Aerospace Division during calendar year 1968.

The Atlas-Centaur has successfully launched seven Surveyor spacecraft toward soft-landings on the moon. In the future Atlas-Centaur rocket vehicles are scheduled to launch Orbiting Astronomical Observatories, Applications Technology Satellites plus two Mariner spacecraft to Mars.

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FOR IMMEDIATE RELEASE

Release 68-4

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Jan. 19 -- More than $1.6 million in major contracts were awarded during November and December by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in six states. They are listed alphabetically by state and city.

CALIFORNIA:	$1,054,742
Gardena	Electroforms, Inc., $146,087, electroforming mach 6 and 7 nozzle shells.
Palo Alto	Hewlett-Packard, $52,355, guarded crossbard scanner.
Sacramento	Aerojet-General Corp., $806,750, test program to determine duration capability of ablative chamber liners.
Torrance	Hughes Aircraft Co., $49,550, analytical study to develop the theoretical design of a traveling wave tube.

CONNECTICUT:	$25,000
Wethersfield	Kahn and Co., Inc. $25,000, design drawings for a 75,000 horsepower dynamometer.
INDIANA:	$59,000
Indianapolis	General Motors Corp., $59,000, fabrication and delivery of 60 laminated porous turbine airfoil vane sections.
MASSACHUSETTS:	$52,000
West Concord	Whittaker Corp., $52,000, study to determine the feasibility of producing oxide fibers by coreduction.
NEW YORK:	$39,565
Buffalo	BirDair Structures, $39,565, inflatable helium storage envelope.
OHIO:	$349,500
Cincinnati	General Electric Co., $349,500, bearing fatigue investigation.

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FOR RELEASE: IMMEDIATE

Release 68-7

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Jan. 31 -- Thomas B. Shillito, an aerospace engineer at the National Aeronautics and Space Administration's Lewis Research Center for the past 20 years, has been appointed to the newly created post of Supersonic Transport Program Coordinator for NASA in Washington, D. C. In his new position he will provide the primary liaison between NASA and the Federal Aviation Administration on matters concerning the development of supersonic transports.

Shillito will have offices at the FAA and stay abreast of technical progress in the SST program. Since NASA has responsibility for technical support of the Supersonic Transport Prototype Program, he will inform NASA at the earliest possible date of any impending requirements it may be called on to meet.

By following NASA research having a bearing on the SST he will be able to bring to the attention of the FAA all findings of significance to its work. Since he is familiar with the capabilities of the NASA centers he will be able to assist in organizing NASA support for any FAA requirements in the most effective and rapid manner possible.

Shillito will report to Charles W. Harper, Deputy Associate Administrator for Advanced Research and Technology (Aeronautics).

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During the past year, Shillito has served in the Office of Development Evaluation and Management Review at Lewis. In this position he assisted in planning research programs and interagency cooperative programs in aeronautics.

Born in El Paso, Texas, Shillito graduated from the University of Alabama in 1942 with a Bachelor of Science degree in Aeronautical Engineering. Following graduation he became a propulsion engineer at Boeing Aircraft Corp., in Seattle, Washington.

In August 1947 he joined the staff of NASA's Lewis Research Center. At Lewis his first work was concerned with water injection augmentation of turbojet engines. This was followed by leadership of an experimental investigation of a 28-inch ramjet engine being developed for the Navy.

In 1951 he became a research supervisor directing investigation in full scale turbojet and ramjets. In 1958 he reoriented his group from airbreathing propulsion to rocket propulsion. Included in his work was the job of adapting existing airbreathing propulsion research facilities to meet rocket development requirements.

In 1962 he was assigned to NASA Headquarters as a member of the RL-10 Technical Assessment Team. The RL-10 engine was the first operational high energy liquid hydrogen-liquid oxygen engine and is used on the Centaur rocket vehicle and Saturn I.

Returning to Lewis he has supervised and coordinated programs in the supersonic airbreathing engine area. During this time he has also participated in many technical assessment activities connected with the Supersonic Transport Program.

His professional memberships include the American Institute of Aeronautics and Astronautics, NASA In-House Committee on Supersonic Aircraft Propulsion, and the Research Committee of the ASME Gas Turbine Power Division.

Mr. and Mrs. Shillito and their three sons will make their home in Potomac, Md.

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FOR RELEASE: 3 P.M. WEDNESDAY
JANUARY 31, 1968

Release 68-8

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Jan. 31 -- A $1,769,200 contract for adapting the Agena second stage rocket for use on the SERT II mission to test ion engines in earth orbit has been awarded to the Lockheed Missiles and Space Company in Sunnyvale, California by the National Aeronautics and Space Administration.

SERT II, which stands for Space Electric Rocket Test, will evaluate the in-flight performance of electron bombardment ion engines over a period of six months or longer and analyze the possible effects of the electric thrustors and their associated electric fields on other spacecraft components such as solar cells, telemetry and control systems.

NASA's Lewis Research Center in Cleveland, Ohio has management responsibility for both the launch vehicle and spacecraft in the SERT II mission.

- more -

The SERT II will be launched with a Thorad-Agena rocket combination from the Western Test Range in the second quarter of 1969. The cost-plus-award-fee contract provides for adapting the Agena to the needs of the mission, vehicle integration management and systems contractor support.

In the case of SERT II the entire Agena second stage will be used as the bed of the spacecraft and be placed in a circular 545 mile earth orbit. It will be equipped with a 1 1/2 kilowatt solar cell array to provide power for the ion engines and other systems.

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FOR RELEASE: IMMEDIATE

Release 68-9

Charles E. Kelsey
(res: 234-3034)

1969

CLEVELAND, Ohio, Feb. 26 -- Assembly of a Brayton Cycle System, a leading contender among space power generation systems, has been completed by NASA's Lewis Research Center and will undergo tests in a simulated space environment this summer.

Although still in the research stage and not yet tied to any specific mission, the Brayton Cycle looks promising as a means to provide the electrical power necessary for lengthy trips (up to five years) in space. A major advantage of the Brayton Cycle is that it is a closed-loop system, completely self-supporting. It operates when an inert gas (in this case a mixture of helium and xenon) is heated to 1600° F. by a heat source and circulated to drive a turbine. In turn, the turbine is used to operate an alternator which provides electric power and also to operate a compressor

- more -

which helps recirculate the gas through the system. The present system was designed by Lewis' Space Power Systems Division to produce from two to ten kilowatts of electric power.

Specifications for all of the major components of the system were written by Lewis. The components were then designed and fabricated by contractors.

The major parts of the new space power system and their tasks are:

--Brayton Rotating Unit, consisting of the turbine, compressor and alternator mounted on a single shaft supported by gas lubricated bearings. Together these rotating components perform the useful work of the system needed to generate electric power. The unit was designed and fabricated by AiResearch Mfg. Company, Phoenix, Arizona.

--Brayton Heat Exchanger Unit, consisting of a recuperator to transfer useful heat within the system and a waste heat exchanger to remove unuseable heat. Both heat exchangers were built for Lewis by AiResearch Manufacturing Company, Los Angeles, California.

--Heat Rejection Subsystem, used to cool the working gas in the waste heat exchanger, and to cool the alternator and the electrical packages mounted on "cold plates." Heat generated by these components is absorbed by a silicone liquid which circulates through the system and transfers the heat to a simulated space radiator for rejection. The cold plates were made by AVCO Corp., Space Systems Div., Lowell, Mass., while the pump

motor assembly which circulates the coolant was developed by Pesco Products, Cleveland, O.

--Gas Management Subsystem, made up of a gas supply tank, pressure regulator, valves, and connecting lines. It is used to start up and stop the Brayton Cycle System, and to adjust the amount of working gas in the system for power level control. This subsystem was provided by TRW Systems, Inc., Redondo Beach, California.

--Electrical Subsystem, including instrumentation, control and monitoring equipment regulates and distributes the 120 volt, 1200 Hertz engine power as well as provides all required control and logic functions. The major components which comprise this subsystem are: the engine control system furnished by AiResearch Mfg. Co., Phoenix, Arizona; the DC power supply, manufactured by Gulton Industries, Hawthorne, Calif.; an electrical control package, fabricated by Hayes International Corp., Huntsville, Alabama; and the electrical harness, designed and fabricated by Lewis.

Contract monitoring as well as coordination of the in-house development and assembly effort is the responsibility of Lewis' Brayton Cycle Branch, Space Power Systems Division. Henry O. Slone, Assistant Division Chief and Head of the Brayton Cycle Branch, credits the "suburb cooperation among many Lewis divisions as well as with contractors in getting the job completed on schedule."

Components of the power conversion system are now in the final stages of assembly into an integrated package. At the end of January the system was shipped to Lewis' Plum Brook Station near Sandusky, O., where the remaining assembly work will be done. In June of this year the Brayton Cycle is scheduled to undergo testing in Plum Brook's new Space Power Facility. It will be the first experiment to be tested in the SPF, a 100 by 120-foot space vacuum chamber.

The Brayton Cycle system first will be tested using an electrical heat source to heat the working gas. In later tests solar and nuclear heat sources will be employed.

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FOR RELEASE: IMMEDIATE

Release 68-10

CLEVELAND, Ohio, Feb. 9 -- The appointment of Hugh W. Harris as Chief, Public Information Office was announced today by Dr. Abe Silverstein, Director of NASA's Lewis Research Center.

In his new position, Harris will head the office responsible for keeping the news media and general public informed about the work being done at the Lewis Research Center. Lewis is NASA's center for basic research in propulsion and space power generation. Propulsion research includes chemical, electrical and nuclear rocket systems as well as advanced aircraft engines. In the space power area Lewis research and development work ranges from solar cells to thermionic diodes and large nuclear electric systems. Lewis also has management responsibility for NASA's intermediate weight launch vehicles such as Atlas-Centaur, Atlas-Agena, Thrust Augmented Thor-Agena and Thorad-Agena rockets.

Harris joined NASA as a Public Information Officer in February 1963. During the past five years he has covered all aspects of research and

- more -

development work at Lewis, writing materials for newspapers, magazines, radio, television and motion pictures.

A native of Cleveland, Ohio, Harris graduated from Western Reserve University in 1956. Following a year of graduate work at Columbia University, he worked as a reporter for the Morris County (N. J.) Daily Record and radio station WMTR. From 1961 to 1963 he was associated with Standard Oil of Ohio (SOHIO) as a staffwriter for public and employee publications.

Harris presently lives at 3510 Columbia Rd., Westlake, Ohio.

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FOR RELEASE: IMMEDIATE

Release 68-13

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Feb. 28 -- Dr. Abe Silverstein, Director of the National Aeronautics and Space Administration's Lewis Research Center, is in Israel this week to deliver the 1968 Von Karman lecture to the Israel Society of Aeronautical Sciences in Tel Aviv.

Dr. Silverstein was selected for this honor by an international committee made up of prominent scientists in the aerospace field. The Theodore von Karman Lecture is a biennial event established in memory of the eminent aerodynamicist in 1964. It was Von Karman who first defined the principles necessary to construct a supersonic airplane.

Titled, "Recent Developments in Aerospace Propulsion," Dr. Silverstein's talk Feb. 28 covers advances in chemical, electric and nuclear rocket propulsion. He particularly emphasizes the importance of reducing the costs of large booster stages, and discusses possible designs to reduce the present price of $1,000 per pound of payload placed in earth orbit to $100 per pound.

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On. Feb. 29, Dr. Silverstein will present a talk on the results of some of NASA's most recent scientific space missions at the Technion-Israel Institute of Technology in Haifa. His Haifa talk is particularly concerned with the benefits of the space program to the world today and the ways in which the use of space technology can help solve the problems of tomorrow.

Dr. Silverstein has been director of the Lewis Research Center since 1961. Lewis is NASA's primary center for research in propulsion and space power generation. It also has management responsibility for NASA medium weight launch vehicles such as Atlas-Centaur, Atlas-Agena, Thor-Agena and Thorad.

From 1958 to 1961 he served as Director of Space Flight Programs for NASA Headquarters in Washington, D. C. In this capacity he was responsible for NASA programs concerned with mission planning, spacecraft design and development and in-flight research and development. Under his leadership, Project Mercury, our nation's first man-in-space program was organized and the groundwork laid for the Gemini and Apollo programs.

Dr. Silverstein has been especially interested in the benefits to the world possible through communications and weather satellites. The direction both of these programs has taken up to the present time was established under his leadership.

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FOR RELEASE: IMMEDIATE

Release 68-16

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, Mar. 6 -- NASA has awarded a $11,600,440 contract for continuation of the development of the SNAP-8 (System for Nuclear Auxiliary Power) system to Aerojet-General Corp., Von Carmen Center, Azusa, Calif.

The SNAP-8 is designed to be a flexible, reliable space power system capable of producing at least 35 kilowatts of electrical power. It uses a mercury-Rankine cycle system with a nuclear reactor for its heat source.

The cost-plus-award-fee contract, which covers a 21-month period beginning Dec. 1, 1967, is for continued development of SNAP-8 components and long-term testing at design conditions for periods up to 10,000 hours.

SNAP-8 is being developed under the technical direction of NASA's Lewis Research Center.

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FOR RELEASE: IMMEDIATE

Release 68-17

Marilyn Edwards

CLEVELAND, Ohio, March 12 -- More than $10.1 million in major contracts were awarded during January and February by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 13 states. They are listed alphabetically by state and city.

ARIZONA:	$989,000
Phoenix	Garrett Corp., $989,000, Brayton cycle engine control system.
CALIFORNIA:	$2,385,648
Belmont	Western Gear Corp., $46,943, high speed gear box assembly.
Canoga	North American Rockwell Corp., $66,057, design criteria monograph on titled turbines and turbopump bearings.

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(CALIF. Cont'd)

Long Beach	McDonnell Douglas Corp., $490,220, integration of quiet engines with subsonic commercial aircraft.
Mountain View	Vidar Corp., $55,925, multiplex system 66.
Redondo	TRW Inc., $869,465, Centaur launch vehicle guidance evaluation and analyses.
Sacramento	Aerojet-General Corp., $29,073, design criteria monograph on turbopump shafts and couplings.
San Carlos	Litton Precision Products, Inc., $39,790, theoretical design of crossed field tubes. Litton Precision Products, Inc., $38,155, study to develop design of space borne electrostatically focused klystron amplifiers.
San Diego	International Harvester Co., $225,415, Brayton cycle heat source.
Sunnyvale	United Aircraft Corp., $30,689, design criteria monograph on propellant characteristics. Lockheed Aircraft Corp., $308,000, Agena adaptation, vehicle integration, management and systems contractor support for SERT II flight.
Sun Valley	Barrier, Inc., $28,020, billeto, ablative material.
Sylmar	Spectrolab, $59,877, xenon solar simulator.
Van Nuys	The Marquardt Corp., $98,019, space storable thrustor investigation.

FLORIDA:	$4,884,235
St. Petersburg	Honeywell, Inc., $4,521,671, Centaur guidance system management, engineering and repair for calendar year 1968.
Sarasota	Electro-Mech Res. Inc., $50,280, data processor. World Electronics, $46,934, data logging system.
W. Palm Beach	United Aircraft Corp., $265,350, study of inducer load and stress.
MARYLAND:	$25,099
College Park	Electro Mechanical Research Inc., $25,099, battery testing instrument.
MASSACHUSETTS:	$33,865
Waltham	Bytrex, Inc., $33,865, pressure transudcers.
NEW HAMPSHIRE:	$60,000
Concord	Humphreys Corp., $60,000 measurements of gas concentrations, temperature, velocities and residende in an induction-heated, hydrogen/-argon torch.
NEW JERSEY:	$212,615
Little Falls	Kearfott Systems Division, $91,000, four control moment gyros.
Princeton	Princeton University, $33,917, design criteria monograph for propellant exhaust product characterization.

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(NEW JERSEY Cont'd)		
	Union	S. F. D. Labs., Inc., $51,200, theoretical design of crossed field tubes.
	W. Long Beach	Electronic Associates, Inc., $36,498, dynamic controller.
NEW YORK:		$114,873
	Batavia	Graham Manufacturing Co., $56,000, steam ejector.
	Schenectady	General Electric Co., $58,873, study to develop design of space borne magnetically focused klystron amplifier.
OHIO:		$1,203,223
	Akron	Goodyear Aerospace Corp., $161,027, parts for a cooled plug nozzle assembly for an aircraft jet engine.
	Cincinnati	General Electric Co., $72,099, effects of doping on low chromium high strength nickel base alloy.
	Cleveland	Technitrol Engineering Corp., $40,523, maintain and operate heating, air conditioning and ventilating equipment in the Development Engineering Building.
	Columbus	Scientific Advances, Inc., $46,020, pressure transducers.
	Lima	Westinghouse Electric Corp., $239,635, development of high temperature electrical materials.

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(OHIO Cont'd)	
Olmsted Falls	Rogers Cleaning Service, $615,219, janitorial services.
Toledo	University of Toledo, $28,700, employee training.
OREGON:	$40,005
Albany	Wah Chang Albany Corp., $40,005, 600 ft. tantalum tubing.
PENNSYLVANIA:	$126,150
Emmaus	Air Products & Chemicals, $43,900, krypton gas.
Erie	Zurn Industries, Inc., $47,250, couplings and adapters.
Malvern	Photolastic, Inc., $35,000, scattered light polariscope.
TEXAS:	$30,212
McGregor	North American Rockwell Corp., $30,212, design criteria monograph on propellant performance analysis and prediction.
VIRGINIA:	$65,480
McLean	Radiation Systems, Inc., $65,480, one prototype and one flight model wideband antenna for RF noise measurement system on SERT II flight.

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FOR RELEASE: IMMEDIATE

Release 68-24

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, April 9 -- Twenty outstanding high school science students from four states will participate in a Youth Science Congress April 17-19 at NASA's Lewis Research Center.

The Youth Science Congress, sponsored by the National Aeronautics and Space Administration and the National Science Teachers Association, is held at nine major NASA Centers across the country plus three supplementary locations. In each of the 12 two and a half day meetings, students present oral reports of their investigations or research projects and engage in discussions with the NASA scientists and their fellow science students. The students will also have the opportunity to tour the NASA facilities and nearby aerospace industries.

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The 20 students participating in the Youth Science Congress at Lewis won their all-expense paid trips in competition with 80 other students. Five of the students are from Ohio, five from Indiana, eight from Illinois and two from Michigan.

Scientists from Lewis, Case Western Reserve University Medical School and the Cleveland Public School System will act as evaluators and discuss each technical paper with the student after its presentation. The format of the Youth Science Congress was established to give young scientists the chance to experience writing and presenting a research paper at a technical meeting which is one of the primary means of communication between practicing scientists and engineers.

The subjects of the student's papers range from Cattleya orchid culture and the structure of snowflakes to neutron activation analysis and computer logic circuit design.

Each of the participating students will receive a bronze medallion and certificate.

The students participating in the Youth Science Congress are:

OHIO

Michael D. Applequist, 701 Walnut Drive, Euclid (Euclid Senior High School - 12th grade) Subject: The Ethylenediamine - Nickel (II) Chloride Coordination System.

James W. Kershaw, 24171 Yosemite Dr., Euclid (Euclid Senior High School - 12th grade) Subject: The Study of a Nickel Chloride-Pyridine System.

Paul A. Balog, 5126 Case Road, N. Ridgeville (North Ridgeville High School - 10th grade) Subject: Physiology of Mammalian Hibernation.

Susan K. Conrad, 315 Clinton St., Wauseon (Wauseon High School - 12th grade) Subject: Control of Orotic Acid Induced Fatty Liver in Female Mice.

Laura Anderson, 2924 Rockefeller Road, Wickliffe (Willoughby South High School -12th grade) Subject: Orchid Growth Factors.

MICHIGAN

Bruce Gillespie, 1817 Ann Street, East Lansing (East Lansing High School - 12th grade) Subject: Determining the Rotation Rates of our Sun.

Sam J. Kennedy, 2698 Burnham Road, Royal Oak (Catholic Central High School - 11th grade) Subject: Natural Variations in Snowflake Structure.

INDIANA

Richard D. Oliver, 1015 Markle Ave., Elkhart (Elkhart High School - 11th grade) Subject: Variables Affecting Electrolytic Resistance.

INDIANA (Continued)

Robert B. Gibson, 8242 Maple Lane, Evansville (William Henry Harrison High School - 12th grade) Subject: Effects of Uneven Cathode Temperature on Electron Beam Characteristics.

April D. Baker, 2904 N. Tillotson Ave., Muncie (Muncie Central High School - 12th grade) Subject: The Isolation of Two Native Forms of Bovine Plasmiogen.

Ginny Colten, 3910 Nall Court, South Bend (Andrew Jackson High School - 10th grade) Subject: Finite Number Systems: Their Construction and Their Uses.

Daniel L. Dvorak, 2224 N. 26th Street, Terre Haute (Paul Schulte High School - 12th grade) Subject: Simtran: The Simulation Translator.

ILLINOIS

Kenneth J. Biba, 7725 W. Sherwin, Chicago (Notre Dame High School for Boys - 12th grade) Subject: Photometric Analysis of the Cepheid Variable, Zeta Geminorum.

Alice A. Kelikian, 6921 North Ridge Ave., Chicago (Roger C. Sullivan High School - 11th grade) Subject: Immunochemical Study of Microsomal Subfractions.

Robert M. Swift, 6741 North Rockwell St., Chicago (Stephen Tyng Mather High - 12th grade) Subject: Biochemical Study of Prostaglandins.

Shelly C. Bernstein, 3840 W. Chase Ave., Lincolnwood (Niles Township Community High School - 11th grade) Subject: Neutron Activation Analysis: The Szilard-Chalmers Reaction.

Evelyn M. Karson, 3845 W. Jarvis Avenue, Lincolnwood (Niles Township School - 12th grade) Subject: Light Energies in Photosynthesis.

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ILLINOIS (Continued)

Leila Novak, 6944 North Kedvale Ave., Lincolnwood (Niles Township Community High School - 12th grade) Subject: The Effects of Gamma Rays on the Growth of Phaseolus Vulgaris.

Malcolm S. Hoge, 21851 Central Park Ave., Park Forest (Rich East Township High School - 12th grade) Subject: Methods of Determining the Sum of a Finite Series.

Charles S. Colodny, 5200 Wright Terrace, Skokie (Niles Township Community High School - 11th grade) Subject: Identification of Cryptoexplosion Structures in the Earth's Crust (Cryptovolcanic or Astrobleme?).

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FOR RELEASE: IMMEDIATE

Release 68-29

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, May 3 -- Major organizational changes establishing three new divisions at NASA's Lewis Research Center have been announced by Dr. Abe Silverstein, Director.

The reorganization, which reflects the growing emphasis on aeronautics at Lewis, establishes:

--A new Special Projects Division for research on reduction of jet engine noise and on problems of vertical or short take-off and landing aircraft. Dr. Seymour C. Himmel was named Chief of this division and also to the newly-created post of Assistant Director for Aeronautics. Dr. Himmel has been serving as the Assistant Director for Launch Vehicles. Newell D. Sanders, Chief of the Chemistry and Energy Conversion Division, will take on additional duties as Assistant Chief

- more -

of the Special Projects Division.

--A new Wind Tunnel and Flight Division for studies of aerodynamic aspects of flight vehicles with emphasis on propulsion problems. Appointed Division Chief is Milton A. Beheim, moving up from his job as Chief of the Aerodynamics Branch, Advanced Systems Division.

--A new Launch Vehicles Division, comprising the previously separate Centaur, Agena and Atlas Project offices. This division, to be headed by Edmund R. Jonash, formerly Chief of the Centaur Project Office, will have responsibility for all of Lewis' launch vehicle programs. William R. Dunbar becomes Project Manager for Centaur. H. Warren Plohr continues in his capacity as Agena Project Manager and Edward F. Baehr as Atlas Project Manager.

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FOR RELEASE: IMMEDIATE

Release 68-30

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, May 6 -- Three engineers of NASA's Lewis Research Center are slated to present papers on recent research findings at technical conferences in Cleveland and Philadelphia this week.

Two papers will be given at the 1968 Annual Meeting and Biennial Lubrication Show of the American Society of Lubrication Engineers, held at the Sheraton-Cleveland Hotel, May 6 - 9. Harold E. Sliney, head of Lewis' Lubrication Section, Fluid System Components Division, will give a "Preliminary Evaluation of Greases to 600° F and Solid Lubricants to 1500° F in Ball Bearings." Co-author of the paper is Robert L. Johnson, chief of the Lubrication Branch at Lewis.

"Adequate wear life and acceptable reliability are two of the most difficult problems in the area of solid lubrication," according to Sliney and Johnson.

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Research designed to evaluate high temperature lubricants found that a fluorocarbon grease provided bearing lubricant for longer times than others at 450° F and 600° F. In the area of solid lubricants it was found that bearings lubricated with barium fluoride or calcium fluoride coatings ran successfully for extended time periods (up to 1,000 hrs) at useful loads.

Also to present a paper at the ASLE meeting is John Przybyszewski of Lewis' Space Environment Lubrication Section, Fluid System Components Division. His topic is "Lubrication of Sliding and Rolling Element Electrical Contacts in Vacuum."

Przybyszewski explains in his paper that problems with electrical contacts associated with spacecraft mechanisms develop because the lubricants used are subjected to high vacuum, radiation, and temperature extremes of space over long periods of time.

A review of literature on electrical contact lubricants indicates that several traditional types such as graphite and high altitude brush materials do not work well under extreme vacuum conditions, according to Przybyszewski. However, his investigations also revealed that certain thin, metallic films may be successfully employed as lubricants if they can be made adherent to the contact surface. Metallic films have the significant advantages of good electrical conductivity and vacuum stability.

At the Fluids Engineering Conference sponsored by the American Society of Mechanical Engineers on May 6, Nelson L. Sanger will present a paper on "A Jet Pump Cavitation Prediction Parameter." The conference will be held at the Bellevue Stratford Hotel in Philadelphia, Pa.

Sanger, an engineer in Lewis' Pump and Compressor Branch, Fluid System Components Division, will review and compare previous investigations of cavitation in jet pumps, and present an improved method of predicting this phenomenon.

Cavitation is a condition occuring when the working fluid of a pump vaporizes due to low local pressures. Large amounts of vapor result in the loss of pump flow rate and of pressure rise.

Sanger's prediction parameter, confirmed by tests at Lewis, will be useful in the design of jet pumps for space electric power generating systems and aircraft fuel pumps.

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PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: TUESDAY P. M.
May 7, 1968

Release 68-31

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, May 7 -- Tribute was paid today to the outstanding technical competence and leadership of two engineers of NASA's Lewis Research Center.

At a President's Luncheon held at noon in the Sheraton-Cleveland Hotel for members of the American Society of Lubrication Engineers, Robert L. Johnson was installed as the national president of ASLE and Donald H. Buckley received the Alfred E. Hunt Memorial Award for the outstanding technical paper of the year.

The Honorable Mayor Carl B. Stokes was scheduled at the luncheon to welcome the more than 1500 engineers attending ASLE's Annual Meeting in Cleveland this week (May 6 - 9). The meeting features a Lubrication Show and a series of technical sessions based on the theme, "Tomorrow's Lubricants

- more -

through Today's Testing."

Johnson, chief of Lewis' Lubrication Branch, moves up to the presidency of the 3200-member Society following service this past year as vice president-at-large and as national director in charge of research and education from 1962 to 1967.

His experience in fundamental and applied research on lubrication for aerospace devices spans a 26-year career with NASA and its predecessor organization, the National Advisory Committee on Aeronautics.

Johnson is the United States delegate and chairman of the Wear of Engineering Materials group for the international Organization for Economic Cooperation and Development. He has authored more than 100 papers in his field and twice has received the ASLE Hunt Memorial Award.

Johnson resides at 4503 West 224th Street, Fairview Park, O.

Buckley received this year's Hunt Memorial Award for his paper on "Friction Characteristics in Vacuum of Single and Polycrystalline Aluminum Oxide in Contact with Themselves and Various Metals." The research report on Aluminum Oxide, a ceramic material of interest due to its low friction and wear characteristics, appeared in the April 1967 issue of ASLE Transactions.

It received the annual award for being "the best paper published in the Society's official journals by one or more members of ASLE."

Head of Lewis' Space Environment Lubrication Section, Buckley works on lubrication problems for space applications and has distinguished himself as an outstanding contributor in his field. In 1960 he shared the Hunt Memorial Award with Johnson and last March received the Technical Achievement Award from the Cleveland Technical Societies Council.

Buckley resides at 5630 Revere Drive, North Olmsted, O.

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FOR IMMEDIATE RELEASE

Release 68-33

Marilyn Edwards

CLEVELAND, Ohio, May 13 -- More than $3.3 million in major contracts were awarded during April by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in eight states. They are listed alphabetically by state and city.

CALIFORNIA:	$785,367
Canoga Park	North American Rockwell Corp., $33,000, design criteria monograph entitled, "Turbopump Gears."
Pasadena	Electro-Optical Systems, Inc., $152,700, development of a hydrogen-oxygen electrolytic regenerative fuel cell.
Redondo Beach	TRW Inc., $99,979, television broadcast satellite study.
Sacramento	Aerojet-General Corp., $343,500, study of hubless converging inducers performance in steady and transient operation. Aerojet-General Corp., $156,188, development of cost-optimized insulation system.

- more -

COLORADO:	$974,500
Denver	Martin-Marietta Corp., $460,100, Titan III improved Centaur integration study.
Pueblo	Lluts Construction Co., $514,400, construction of hypersonic propulsion tunnel.
CONNECTICUT:	$411,029
New Haven	United Nuclear Corp., $334,519, fixed fuel assemblies and control rod assemblies.
Stamford	Cober Electronics Inc., $76,510, power supplies.
FLORIDA:	$125,000
Sarasota	Weston Instruments Inc., $125,000, data system components.
NEW JERSEY:	$25,200
Harrison	RCA Electronic Components, $25,200, composite superconductive ribbon.
OHIO:	$896,601
Cincinnati	General Electric Co., $777,327, design and fabrication of Brayton Cycle solar heat receiver.
Cleveland	Clevite Corp., $32,043, recording system. Honeywell Inc., $87,231, recording oscillographs.

PENNSYLVANIA:	$94,036
State College	Tem-Pres Research Inc., $94,036, high temperature oxidation resistant cobalt base alloys.
UTAH:	$29,811
Magna	Hercules Inc., $29,811, design criteria monograph testing of solid rocket motor.

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FOR RELEASE: IMMEDIATE

Release 68-36

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, June 7 -- Replacement of major beryllium components in NASA Lewis Research Center's 60 megawatt test reactor is one which is a significant accomplishment in nuclear reactor technology and may aid in the construction of better reactors in the future.

Man's knowledge of the effects of nuclear radiation is still in the formative stages. The Lewis reactor, located at Plum Brook Station near Sandusky, Ohio, one of the largest test reactors in the country, is helping extend this knowledge of various materials. However the lack of such detailed information often causes problems in the construction of reactors themselves.

The Plum Brook reactor uses an uranium-aluminum alloy core surrounded by beryllium plates which act as primary neutron reflectors and help channel the flow of cooling water. During the five years the reactor has been in operation, the neutron bombardment of the beryllium has caused gas formation in the metal, expansion and bowing of the plates, and embrittlement of the metal. This eventually caused one plate to crack.

H. B. Barkley, Jr., Chief of the Reactor Division at Plum Brook, said,"Since other nuclear reactors have experienced this same problem, a surveillance program to monitor the expansion of the beryllium was established some time ago, and replacement parts procured. In the past, however, no one had ever attempted to replace major beryllium components."

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On February 17 the reactor was shut down for the replacement of the plates and installation of several experimental facilities. The fuel rods and other hardware were removed.

The removal of the beryllium plates was complicated because each plate was fastened to the lower grid of the reactor with five bolts. These bolts were located in the bottom of each plate and in a position that made them inaccessible for mechanical removal. A further complication was the necessity for technicians to work through ten feet of water with long handled tools to avoid any dangerous radiation.

The extreme hardness of the plates and inaccessibility of the bolts lead to the selection of electrical discharge machining (EDM) as the method for removal. The EDM process uses an electric arc to chip away metal. Through careful control of the electrical flow through an electrode to the work piece and proper positioning of the electrode very precise holes or patterns can be cut in a piece of metal. Lewis' Fabrication Division made a special EDM rig and performed the cutting operation. Since the water used for shielding had to be used as the electrolyte for cutting, additional problems were introduced. To avoid contamination of the primary water system, a special long flat nickel electrode material was selected and a suction device installed to remove the chips of beryllium.

A strict radiation safety program was enforced during the entire operation. Monitoring was provided to detect direct and airborne radiation and controlled work conditions were imposed.

After the ten bolts were cut the beryllium plate on the north side of the reactor was removed without difficulty. The top half of the south plate, the one which cracked, was removed also. However the bottom half had grown enough in size that it was wedged securely in place. Again the EDM process had to be used to cut it free. Next the new beryllium plates were installed.

The Materials and Structures Division will participate in the analysis of the old irradiated beryllium plates to try to learn more about the formation of gas in the metal and other effects of intense radiation. The original plates had been in the core since the reactor was put into operation five years ago (37,256 megawatt days of operation).

The installation of several major plant and experimental facilities were also conducted in the shutdown period. These facilities included providing special environments, gaseous and extreme heat or cold, for the experiments being placed in the reactor irradiation.

The Plum Brook reactor is used for testing work in support of the application of nuclear energy to space propulsion and electrical power generation. Items tested in the reactor range from simple materials to sub-systems such as thermionic power generation components and actuators for experimental nuclear rocket engines.

The Space Power Systems Division, Fluid System Components Division, Nuclear Systems Division, Engineering Design Division, Technical Services and Engineering Services were involved in the activities in addition to the Reactor Division.

To date the Plum Brook test reactor has performed 1040 irradiations in 75 reactor operation cycles. A reactor operation cycle now consists of about twelve days of operation at 60 mw and a two day shutdown period. There are currently 31 active experiments in the irradiation program.

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FOR IMMEDIATE RELEASE

Release 68-38

Marilyn Edwards

CLEVELAND, Ohio, June 12 -- More than $1.3 million in major contracts were awarded during May by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in ten states. They are listed alphabetically by state and city.

CALIFORNIA:	$211,889
Canoga	North American Rockwell Corp., $47,813, study of the effect of baffles on combustion instability.
Santa Fe Springs	Haveg Industries, Inc., $26,284, rocket cylinders.
Sunland	Applied Research Labs., $137,792, electron probe x-ray microanalyzer.
CONNECTICUT:	$141,500
Berlin	New England Machine & Tool Co., $36,500, turbine blade contour plotting machines.
E. Hartford	United Aircraft Corp., $105,000, design study of a Brayton rotating unit operating on oil lubricated rolling element bearings.

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MICHIGAN:	$25,450
Ann Arbor	Easco-Sparcatron, Inc., $25,450, sparkmatic impulse generator.
MINNESOTA:	$66,800
Minneapolis	Rosemount Engineering Co., $66,800, platinum resistance temperature sensors.
MISSOURI:	$155,518
St. Louis	McDonnell Douglas Corp., $155,518, 25KW MPD arc thrustor with radiation cooled electrode assembly.
NEW JERSEY:	$156,000
Newark	Engelhard Minerals & Chemicals, $156,000, high temperature thermocouple development program.
NEW YORK:	$134,973
Latham	Mechanical Technology, Inc., $134,973, gas bearings for Brayton cycle rotating unit.
OHIO:	$397,785
Cleveland	Cleary Construction, $78,198, construction of auxiliary equipment room and associated systems for V/STOL facility. Honeywell, Inc., $57,097, X-Y recorders. The Bristol Co., $31,450, potentiometer recorders. TRW, Inc., $91,700, flaw definition through non-destructive testing. Cleary Construction, $26,969, construction of foundations and installing pressure vessels at the Rocket Engine Test Facility.

OHIO (Cont'd)	
Columbus	Battelle Memorial Institute, $75,000, evaluation of lubricants for high speed, high temperature applications.
Dayton	Ampex Corp., $37,371, magnetic tape recorder/reproducer systems.
OREGON:	$69,221
McMinnville	Field Emission Corp., $69,221, research on behavior of various adsorbates on metal surfaces.
PENNSYLVANIA:	$25,812
King of Prussia	SKF Industries, Inc., $25,812, rolling-element contact fatigue testing data.

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FOR IMMEDIATE RELEASE

Release 68-41

Hugh W. Harris
(res: 777-2228)

CLEVELAND, Ohio, June 19 -- The honor of being named a "Fellow" of the American Society of Mechanical Engineers (ASME) has been conferred on Edmund E. Bisson, Assistant Chief of the Fluid System Components Division.

Bisson, a world authority on friction, wear and lubrication of bearings, received the award at a special dinner from William J. Anderson, Chairman of the Lubrication Division of ASME and Chief of Lewis' Bearings Branch.

The award was made in recognition of the significant advances in understanding of the technology of bearings and lubricants under extreme conditions of speed, load, both high and low temperatures and environments ranging from the hard vacuum of outer space to the corrosive forces of liquid metals. Bisson's personal work and his accomplishments

- more -

through the management and training of interdisciplinary scientists and engineers is found in many advanced aircraft and aerospace devices.

A past president of the American Society of Lubrication Engineers (ASLE), Bisson has been honored many times for his outstanding work. ASLE presented Bisson with its Hunt Memorial Award for the outstanding technical paper of 1953 and its National Award in 1967 which carries with it lifetime honorary membership in the organization.

In 1966 he was awarded the Jacques de Vaucanson medal by the French technical society Groupement pour l'Avancement de la Mecanique Industrielle.

During his career Bisson has published more than 45 technical papers and a text book which is considered a standard reference throughout the free world. His early papers on the influence of solid surface films and solid lubricants are considered classics in the field.

Bisson began his career as a government engineer in 1939 at the Langley Research Center of the former National Advisory Committee for Aeronautics following graduation from the University of Florida. Transferred to Lewis in 1943, he was appointed Head of the Piston Ring and Cylinder Barrel Research Section. In 1945 he became Head of the Lubri-

cation, Friction and Wear Section and in 1955 Assistant Chief of the Fluid System Components Division where he directs much of NASA's research effort in lubrication, wear and bearings.

Bisson, his wife, Fernande and their three children live at 20786 Eastwood Ave., Fairview Park.

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News

LEWIS RESEARCH center

21000 BROOKPARK ROAD CLEVELAND, OHIO 44135
PUBLIC INFORMATION OFFICE
PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: IMMEDIATE

Release 68-43

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, June 19 -- For ten weeks this summer, 26 university faculty members will continue their education through research, special lectures and seminars as Faculty Fellows at NASA's Lewis Research Center.

The Summer Faculty Fellowship Program, now in its fifth year, is sponsored jointly by Lewis and Case-Western Reserve University under the auspices of NASA and the American Society for Engineering Education.

The Fellows began their summer work at Lewis on June 10 and were briefed on the program by Dr. Walter T. Olson, co-chairman of the program for Lewis and an assistant director, and Dr. Frederic A. Lyman, co-chairman for CWRU and an associate professor in the School of Engineering.

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At Lewis the Fellows will conduct research projects in their areas of interest and will attend a series of special lectures relating to Turbomachinery for Space and Aircraft. Specialists from Lewis, CWRU and industry will conduct the lectures and seminars.

The program has been designed to further the professional knowledge of the participants, to stimulate an exchange of ideas, and to enrich and refresh the research and teaching activities of the universities.

Seven other NASA installations co-sponsor similar programs with ASEE. These include Ames Research Center, Electronics Research Center, Marshall Space Flight Center, Goddard Space Flight Center, Jet Propulsion Lab, Manned Spacecraft Center, and Langley Research Center. Lewis piloted this fellowship program in 1964 and has had 60 faculty members participate to date.

The participants, mostly assistant and associate professors of science and engineering, in this summer's program, have been assigned to the following divisions:

Airbreathing Engines -- Dr. William L. Amminger, Memphis State University; Dr. Tah-teh Yang, Clemson University;

Chemistry and Energy Conversion -- Dr. Robert G. Watts, Tulane University; George W. Harter, University of California; Dr. J. Douglas

Hutchison, University of Tulsa; Dr. Paul J. Marto, U.S. Naval Postgraduate School;

Electromagnetic Propulsion -- Dr. Albert W. Carlson, Tufts University; Dr. Andrew J. Eggenberger, University of South Carolina; Dr. David L. Johnson, Kent State University; Dr. Clarence W. Schultz, University of Connecticut; Dr. Chaim Z. Kamien, Lowell Technological Institute; Dr. Byron E. Thinger, San Francisco State College;

Fluid System Components -- Dr. Charles W. Allen, Chico State College; Alfred W. Joensen, Iowa State University;

Materials and Stresses -- Dr. Wilbur E. Jorgenson, University of Kansas; Dr. William G. Fleck, Cleveland State University;

Nuclear Systems -- Paul T. Bauer, University of Dayton; Dr. Henry C. Perkins, University of Arizona; Dr. Ronald L. Marshall, Cleveland State University; Dr. James E. Poth, Miami University; Dr. Walter Chmielewski, University of Akron; Dr. Wilbur M. Franklin, Kent State University; Dr. Edward Gelerinter, Kent State University;

Space Power Systems -- Lowell E. Lingo, Syracuse University; Dr. Kenneth Wark, Jr., Purdue University;

Spacecraft Technology -- Dr. Roland J. Raco, Newark College of Engineering.

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News

NASA LEWIS RESEARCH center

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FOR RELEASE: IMMEDIATE
June 26, 1968

Release 68-44

Hugh W. Harris
(res: 932-3966)

CLEVELAND, Ohio, June 26 -- A $1,358,728 incentive contract to design and build a prototype airborne computer unit for the Centaur launch vehicle has been awarded to Teledyne Systems Company of Northridge, California by the National Aeronautics and Space Administration.

The new computer will be the nerve center for the Centaur's integrated guidance and flight control system. Under the contract Teledyne will also supply ground support equipment, software and conduct ground evaluation tests. The computer system will be based on one of the contractor's present advanced computers.

The contract also provides NASA with the option to purchase five additional digital computer units, support equipment and spare parts for $759,872.

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The development part of the contract will take 23 months to complete.

NASA's Lewis Research Center in Cleveland, Ohio will manage this contract as part of its overall responsibility for the Centaur launch vehicle.

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News

LEWIS RESEARCH center

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PUBLIC INFORMATION OFFICE

PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR IMMEDIATE RELEASE

Release 68-46

Marilyn Edwards

CLEVELAND, Ohio, July 16 -- More than $13 million in major contracts were awarded during June by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in 18 states. They are listed alphabetically by state and city.

ALABAMA:	$27,696
Huntsville	Hayes International Corp., $27,696, control packages.
CALIFORNIA:	$5,718,752
Azusa	Aerojet-General Corp., $95,469, cycle testing of boron filament-wound tanks.
Berkeley	Cyclotron Corp., $32,500,cyclotron dees.
Canoga Park	North American Rockwell Corp., $35,963, design criteria monograph for liquid propellant rocket engine combustion instability dampers. North American Rockwell Corp., $35,861, design criteria monograph on liquid propellant gas generators. North American Rockwell Corp.,

- more -

CALIF. (Cont'd)

Canoga Park	$36,850, design criteria monograph on liquid propellant rocket engine injectors. North American Rockwell Corp., $406,750, rotating and positive displacement pumps for low thrust rocket engines. North American Rockwell Corp., $373,414, lithium-fluorine-hydrogen propellant investigation. North American Rockwell Corp., $198,692, investigation of gas augmented injectors. North American Rockwell Corp., $36,325, design criteria monograph for liquid propellant rocket engine nozzles. North American Rockwell Corp., $38,886, design criteria monograph turbopump systems for rocket engines.
Concord	Eldorado Electronics, $29,650, counter-timer and digital counter.
Los Angeles	Garrett Corp., $75,450, gravitational effects and stability in potassium multitube condensers.
Menlo Park	Standford Research Institute, $51,360, improved oxidation resistance of nickel and cobalt super-alloys program.
Monrovia	Marshall Industries, $49,721, an experimental program of aircraft fuel tank fire hazards related to lightning.
Northridge	Teledyne Systems Co., $1,358,728, development of digital computer unit and support equipment for use on Centaur guidance system.
Newport Beach	McDonnell Douglas Corp., $98,525, development of a rechargeable zinc-oxygen power system.
Palo Alto	Lockheed Missiles & Space Co., $52,322, investigation of porous oxygen electrode structures.

- more -

CALIF. (Cont'd)

Pleasanton	General Electric Co., $138,823, investigation of uranium dioxide loss rates in central vent emitters.
Redondo Beach	TRW, Inc., $362,200, investigation of thrusters for cryogenic reaction control systems.
Redwood City	Ampex Corp., $91,163, research and development of foil journal bearings for Brayton cycle turbomachinery.
Sacramento	Aerojet-General Corp., $621,925, large solid rocket motor propellant improvement program. Aerojet-General Corp., $170,500, investigation of twin spool turbopump performance. Aerojet-General Corp., $413,547, investigation of discrepancies on nozzle performance reliability. Aerojet-General Corp., $35,171, design criteria monograph for fluid-cooled combustion chambers. Aerojet-General Corp., $35,116, design criteria monograph liquid propellant self-cooled combustion chambers.
San Carlos	Litton Industries, $29,473, klystron tubes.
San Diego	Gulf General Atomic Inc., $216,000, thermionic materials for space power applications. Gulf General Atomic Inc., $60,718, program to re-evaluate neutron spectra in liquid hydrogen.
Santa Ana	Royal Industries, $39,053, pre-cryogenic shut-off valves.
Santa Monica	McDonnell Douglas Corp., $244,469, development of a heat sterilizable 40-ampre hour silver zinc cell. McDonnell Douglas Corp., $71,826, development of improved zinc electrodes for secondary batteries.

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CALIF. (Cont'd)	
Sunnyvale	Fairchild Instrumentation, $31,302, digital voltmeters and hardware. Lockheed Aircraft Corp., $151,000 determine the thermal performance of multi-layer insulation systems.
COLORADO:	$182,300
Denver	Martin Marietta Corp., $182,300, composite overwrapped metallic tanks.
CONNECTICUT:	$182,605
E. Hartford	United Aircraft Corp., $148,800, kinetic flow performance in nozzles.
W. Hartford	Colt Industries, $33,805, tape controlled drill.
FLORIDA:	$1,919,944
Sarasota	Weston Instruments, Inc., $46,308, data system integration.
W. Palm Beach	United Aircraft Corp., $885,868, basic contract for single stage experimental evaluation of tandem-airfoil rotor and stater blading for compressors. United Aircraft Corp., $31,048, development of a twin ram induction combustor. United Aircraft Corp., $755,000, management and engineering services for one year period in support of Pratt & Whitney Aircraft RL10A-3-3 rocket engine. United Aircraft Corp., $201,720, a space storable engine characterization.
ILLINOIS:	$54,650
Chicago	Sciaky Bros., Inc., $54,650, modification of electron beam gun welder.

INDIANA:	$254,995
Indianapolis	General Motors Corp., $254,995, experimental investigation of highly loaded turbine tandem rotor blading.
MARYLAND:	$75,000
Laurel	Hydronautics, Inc., $75,000, experimental research on high frequency fatigue at elevated temperatures.
MASSACHUSETTS:	$124,081
Bedford	Diffraction Ltd., Inc. $44, 146, clear fused silica coated lenses.
Pittsfield	General Electric Co., $50,000,research program to define the hazards of lightning on aircraft electrical systems.
Waltham	Fisher Scientific Co., $29,935, quantimet (QTM) image analyzing computer.
MICHIGAN:	$85,523
Detroit	Primeway Tool & Eng. Co., $33,795, solar arc lamp. Federal Mogul Corp., $51,728, powders and extrusions from superalloys.
MINNESOTA:	$32,036
Minneapolis	MTS Systems Corp., $32,036, servo control units.
NEBRASKA:	$96,901
Ogallala	TRW, Inc., $96,901, capacitor improvement program.

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NEW JERSEY:	$305,005
Metuchen	Gulton Industries, Inc., $97,005, non-magnetic stable cadmium electrode for silver cadmium cells.
Paramus	ARDE, Inc., $208,000, metallic positive expulsion diaphragm.
NEW YORK:	$430,669
Buffalo	Bell Aerospace Corp., $39,291, design criteria monograph on liquid propellant rocket engine thrust chambers.
Delmar	North Vernon Contractors, Inc., $106,800, operation, maintenance and supervision of steam generating plant at Lewis.
Farmingdale	Fairchild Hiller Corp., $89,740, development of high-temperature polyimide rod seals.
Ithaca	Therm Inc., $58,000, compressor wheel and tandem blade assembly.
Schenectady	General Electric Co., $57,390, SNAP-8 self-actuated seal development.
Syracuse	General Electric Co., $79,448, silicon controlled rectifiers with improved radiation resistance.
OHIO:	$2,225,013
Cincinnati	General Electric Co., $643,000, a low-tip speed fan noise demonstration program. General Electric Co., $1,079,000, evaluation of range and distortion tolerance for high mach number transonic stages. General Electric Co., $85,000, improved aluminide coatings for nickel base alloys.

OHIO (Cont'd)	
Cleveland	Wrightco, Inc., $72,173, installation of a liquid fuel system for the Propulsion Systems Lab. Wm. Gould and Assoc., $61,000, architect-engineer services for master plan program phase II Plum Brook Station. Suburban Power Piping Corp., $58,000, installation of helium recovery piping between the Electric Propulsion Lab and the Electric Propulsion Research Building.
Columbus	Battelle Memorial Institute, $27,800, sinusoidal pressure generator development and utilization. Battelle Memorial Institute, $99,100, investigation of methods of producing stainless steel-titanium composites. Battelle Memorial Institute, $99,940, structural stability and mechanical behavior of thermo-mechanically processed dispersion strengthened nickel alloys.
PENNSYLVANIA:	$766,824
Bethlehem	Bethlehem Steel Corp., $28,390, pole bases for the 60-inch cyclotron modification.
Bridgeville	Cyclops Corp., $60,578, wrought nickel base super alloys.
King of Prussia	SKF Industries, Inc., $73,375, high temperature lubricant screening tests.
Lancaster	RCA, $44,163, 66 klystron tubes.
Philadelphia	General Electric Co., $399,618, ground signal processing systems.
Pittsburgh	Westinghouse Electric Corp., $135,000, weldability study of T-111 and ASTAR 811-C.

PENNSYLVANIA (Cont'd)	
Willowgrove	Tinius-Olsen, $25,700, testing machine.
RHODE ISLAND:	$97,648
Providence	Sealol, Inc., $97,648, experimental investigation of bellows for cryogenic seal application.
WASHINGTON:	$545,130
Seattle	The Boeing Co., $197,860, metal tank fracture and design criteria. The Boeing Co., $197,770, stress corrosion of metal tanks. The Boeing Co., $149,500, fundamental study of transpiration cooling.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
21000 BROOKPARK ROAD
CLEVELAND, OHIO 44135
TELEPHONE: 216-433-4000 TWX: 216-433-4766 TELEX: 098-5218

IN REPLY REFER TO:

September 6, 1968

NOTE TO EDITORS:

On Wednesday and Thursday, September 11 and 12, the National Aeronautics and Space Administration will conduct a special conference on new technology for the Electric Power Industry.

The conference is part of NASA's Technology Utilization Program for making new developments and advances in science and engineering available as quickly as possible to all segments of the general economy. In this case the technology being developed for providing electrical power for use in space will be discussed for executives and technical managers of the nation's electric power industry.

James E. Webb, NASA Administrator, will address conference participants Wednesday evening at 8:45 p.m. following dinner. An informal press conference with Mr. Webb will be held Wednesday afternoon between 4:45 and 5:15 p.m. in Lewis' Development Engineering Building.

We believe that the identification of new ideas and techniques being developed in our nation's aerospace program and their transfer to use in other industries is one of the most significant contributions being made by NASA.

You are invited to attend the entire conference or any part of it. Arrangements can be made by calling my office.

Hugh W. Harris
Chief, Public Information

68/55

Attachment

News

NASA LEWIS RESEARCH center

21000 BROOKPARK ROAD CLEVELAND, OHIO 44135

PUBLIC INFORMATION OFFICE

PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: IMMEDIATE

Release 68-55

Hugh W. Harris
(res: 932-3966)

1968

CLEVELAND, Ohio, Sept. 10 -- Technology being developed by the National Aeronautics and Space Administration to provide the electrical power needed in aircraft and in space by rockets, satellites, interplanetary probes and manned spacecraft will be brought down to earth this week.

Engineers and executives from electric power companies and their major suppliers across the country have been invited to attend a special conference at NASA's Lewis Research Center here designed especially for them. Called the "Conference on Selected Technology for the Electric Power Industry", the power company officials will be brought up to date on the work being done by NASA related to the electric power generation field. The program was developed in cooperation with the Edison Electric Institute, an organization representing investor owned electric utility companies. Technical managers from several major utilities helped to select conference topics.

The conference is part of the continuing effort by NASA to encourage the rapid application of new knowledge being acquired in the space program to all segments of the nation's economy. Lewis Research Center has been a leader in this effort formally known as the Technology Utilization Program. Lewis presented the first technology conference of this type back in early 1964 and since then has presented both general conferences and conferences designed for specific industries

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such as the petroleum industry. Early last year, Lewis held a meeting specifically for small businesses in cooperation with the U.S. Small Business Administration; this meeting helped to establish a pattern that has now been repeated in many other regions of the country.

Dr. Abe Silverstein, Lewis director, will open the conference on Wednesday morning, September 11. That evening, James E. Webb, NASA Administrator, will discuss the impact of the space program on the present and future technological development of the country.

During the two day session, NASA panelists and individual speakers will review the technology of several areas of interest to the power industry. Nuclear reactor development, steam or vapor systems for generating electricity, gas turbine systems, engineering mechanics and materials, and direct energy conversion are a few of the fields to be covered. Other speakers will discuss the philosophy and advantages of automatic, computer-controlled checkout of complex systems, advances in instrumentation, obtaining high levels of reliability, bearings and seals, and the application of cryogenic and superconducting techniques to electrical equipment. Dr. Bernard Lubarsky, Assistant Director for Power, and Robert English, Chief, Space Power Systems Division, serving as conference co-chairmen, have helped to develop the material being presented.

Dr. Walter T. Olson, an assistant director of Lewis and chairman of the conference, says, "Aerospace activities both use and create new scientific knowledge and new engineering skills. This body of knowledge is large and growing explosively. It is important that every segment of our nation's industry know about these advances, and how to obtain the technical details and help they may need in applying them. Seed ideas for new products are being developed every day. Some may even lead to radical changes within industry and the creation of new ones.

"The aerospace program results in the advancement of knowledge in almost every scientific and engineering discipline. One of the most important jobs of NASA is to identify these advances and make them quickly available for the benefit of every citizen."

The conference will close on Thursday with a review of the methods for learning about and obtaining technical information being developed by NASA and its contractors. This will be followed by a tour of the Lewis Center.

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News

NASA LEWIS RESEARCH center

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FOR IMMEDIATE RELEASE

Release 68-56

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, Sept. 16 -- The Propulsion Systems Laboratory expansion presently under construction at NASA's Lewis Research Center entered its second phase with the awarding of a $3,290,500 contract to Pittsburgh DesMoines Steel Company.

The contract will cover the fabrication and installation of the heavy steel test chambers and their related systems to be housed in the one-story building. According to Robert Godman, Chief of Engineering Services, "It will amount to about 1,500 tons of steel being put into place."

Accounting for part of this large tonnage will be the two altitude chambers which will be used for testing large jet engines and high temperature turbines. The chambers are 24 feet in diameter and 40 feet in length. The altitude chambers with their separate diffusers meet in a common plenum chamber that leads to the primary cooler, measuring nearly 43 feet in diameter and 30 feet long.

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The primary cooler contains 5,500 separate cooling tubes which will be fed by water from a recently completed water tower. The temperature of the air is further reduced as it passes through a spray cooler containing three banks of spray nozzles, spurting water out at the rate of 3,000 gallons per minute. Before the air is exhausted at a temperature of around 120° Farenheit -- cooled down from test temperatures of nearly 3,500° F. -- moisture is removed by a stainless steel mesh located at the exhaust end of the spray cooler.

Pittsburgh Des Moines Steel Co. will fabricate all of the steel necessary to build the altitude chambers and cooling system facilities at its own plant. The "boiler plate" will be shipped to Lewis where final assembly will take place on the site.

Steel will start to arrive at Lewis next spring. The steel work is scheduled for completion by April 1970, concluding the second of four major contracts worth $14 million.

Meanwhile work is continuing on the building's exterior steel frame. The contractor, The Gillmer-Olson Co., has completed about 55% of its work on the foundation and building. That portion should be finished early next year.

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NASA LEWIS RESEARCH center

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FOR IMMEDIATE RELEASE

Release 68-57

Marilyn Edwards

CLEVELAND, Ohio, Sept. 16 -- More than $4.3 million in major contracts were awarded during July and August by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in eight states. They are listed alphabetically by state and city.

CALIFORNIA:	$442,929
Canoga Park	North American Rockwell Corp., $186,770, space storable engine characterization.
Gardena	Electroforms, Inc., $66,079, one mach 5 nozzle.
N. Hollywood	Whittaker Corp., $52,600, pressure transducers.
Oakland	Oakland Machine Works, $41,480, one solar arc lamp assembly.
Oceanside	Hughes Aircraft Co., $58,350, ion pumped vacuum system.
Sunnyvale	United Aircraft Corp., $37,650, design criteria monograph entitled "Solid Propellants."

- more -

CONNECTICUT:	$49,148
Manchester	Mal Tool & Engineering Co., $49,148, high aspect compressor wheel and stator blades.
INDIANA:	$85,000
Indianapolis	General Motors Corp., $85,000, design, fabrication and delivery of six stage axial flow compressor parts.
NEW JERSEY:	$141,875
Little Falls	General Precision Systems, Inc., $54,000, control moment gyros.
Newark	Newark College of Engineering, $87,875, study of heat transfer from impinging jets.
NEW YORK:	$121,778
Clarence	Kistler Instrument Corp., $43,157, piezoelectric pressure transducers.
New York	Union Carbide Corp., $78,621, molded graphite.
OHIO:	$205,799
Cincinnati	General Electric Co., $97,673, effects of vacuum level on solar receiver material.
Cleveland	West Tool & Mfg., Inc., $73,262, JP swirl can combustor assembly. Hewlett-Packard, $34,864, integrating digital voltmeters.

PENNSYLVANIA:	$3,290,500
Pittsburgh	Pittsburgh DesMoines Steel, $3,290,500, expansion of Propulsion Systems Laboratory for supersonic research.
TENNESSEE:	$50,063
Nashville	AVCO, $50,063, coldplate panels for Brayton cycle system.

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News

LEWIS RESEARCH center

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PUBLIC INFORMATION OFFICE

PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: TUESDAY
OCTOBER 1, 1968

Release 68-59

Hugh W. Harris
(res: 932-3966)

CLEVELAND, Ohio, Oct. 1 -- The National Aeronautics and Space Administration completes its first ten years of progress in aeronautical and space research today.

During that time it has spearheaded the greatest advance in science and technology the world has ever seen. In space man has progressed from the ability to orbit a 30-pound satellite to launch vehicles that can place 285,000 pounds in near earth orbit and send 98,000 pounds to the moon.

When NASA was formed back in 1958 man had not yet flown in space. Today American astronauts have clocked nearly 2,000 hours of space flight and are preparing for the first manned landings on the moon.

The Lewis Research Center was one of four major research centers transferred to NASA from the former National Advisory Committee for Aeronautics, and helped form the nucleus of the new space agency on October 1, 1958.

Lewis was established in 1941 as NACA's center for propulsion research. When NASA was established, Lewis continued in this field, but added responsibility for space power generation research and development projects and management of NASA's intermediate weight launch vehicles such as Atlas-Agena, Thor-Agena and Atlas-Centaur.

One of Lewis' major contributions to the nation's space program was managing the development of the Centaur launch vehicle. The country's first high energy rocket vehicle, Centaur uses liquid hydrogen and liquid

- more -

oxygen for its propellants. Difficult to handle because of its super cold character (liquid hydrogen boils at 423 degrees below zero Fahrenheit) the propellant combination provides about 30 per cent more energy than the standard kerosene and liquid oxygen combination.

Centaur, used with a first stage Atlas booster, successfully launched seven Surveyor spacecraft toward soft landings on the moon's surface. Later this month it will be used to launch the 4,400 pound Orbiting Astronomical Observatory into orbit around the earth and early next year will send two Mariner spacecraft to Mars.

In the launch vehicle area, Lewis has managed all of the successful flights of unmanned scientific spacecraft to the moon. In addition to the seven Surveyors, five Lunar Orbiter spacecraft and four Rangers were sent to the moon. Other spacecraft flown on the Atlas-Agena and Thor-Agena combinations under Lewis direction included Mariner spacecraft to Mars and Venus, Nimbus weather satellites, Applications Technology satellites, Orbiting Geophysical Observatories, Pageos and Echo II.

Managing the development of Centaur was a natural step for Lewis. Lewis had begun its pioneering work with liquid hydrogen as a rocket fuel back in the early 1950's. Lewis engineers have worked extensively with other rocket propellants as well ranging from hydrocarbons such as kerosene and storable propellants to the highly volatile liquid fluorine, liquid hydrogen combination.

Liquid chemical rocket engines are not the only area of space propulsion research at Lewis. Lewis is an advocate of the use of large solid chemical rocket engines and managed the development work concerned with the testing of three 260-inch diameter solid rocket motors. Work in the large solid motor area is continuing with studies of thrust vector control techniques, propellant combinations, fabrication methods and case materials. The objective of this work is to develop the technology to build low cost solid booster rockets.

Research and development work has been conducted in all three areas of electric propulsion at Lewis. In the field of electrostatic propulsion, the electron bombardment ion engine was invented at Lewis in 1960 and was the first ion engine to be successfully tested in space. Early next year, a spacecraft being developed at Lewis will test the ability of ion engines to operate continuously for six months or longer in space.

In the space power fields, the interest and contributions of Lewis scientists and engineers are as varied as in the propulsion area. Silicon and thin film solar cells, high and low temperature batteries, fuel cells, thermionic diodes and large rotating machinery power generation systems are all being worked on.

The largest space power development project at Lewis is SNAP-8 (Space Nuclear Auxiliary Power). The objective of the system is to produce 35,000 watts of electric power for 10,000 hours or longer. The SNAP-8 system uses heat from a nuclear reactor (being developed by the Atomic Energy Commission) to heat a liquid metal which vaporizes and turns a turbine similar to steam turbines here on earth; the metal vapor is cooled and condensed in a radiator for re-use. Most of the major components have now successfully passed 10,000 hour tests.

Work in the field of space technology is only half the story at Lewis, however, Lewis' historic interest in aircraft propulsion has been carried on since the laboratory's inception in 1941.

Lewis' first work was on the piston engine. During World War II Lewis developments included: a scientific basis for evaluating the knock rating characteristics of aircraft fuels; successful correlations for both liquid and air cooling of engines; and improved designs for turbo-superchargers.

Immediately at the end of World War II, Lewis initiated research pertaining to jet propulsion and made major contributions in developing turbojet combustion chambers that would operate reliably above the previous ceilings of 10 to 20 thousand feet; a transonic compressor that made supersonic turbojets possible; satisfactory and controlled afterburners; and supersonic inlets and high speed combustion for ramjets. During the first decade of the turbojet, virtually every engine powering U.S. jet aircraft was put through its paces at Lewis to have some items of Lewis know-how incorporated in it.

Significant turbine work at Lewis included cooling techniques, and improved materials for turbine blades. Through the years the desire to increase the temperature in turbine engines has kept Lewis in the business of both materials and cooling techniques. Today the work is concerned with advanced engines for supersonic transports and vertical take-off and landing craft.

Another area of research and development work today at Lewis is in reducing the noise of turbojet engines. Lewis has responsibility for the quiet engine programs whose goal is to develop an engine for standard transport aircraft such as the 707 and DC-8 that will have a noise level 10 to 20 decibles lower than today's engines.

Only 10 years have passed since the National Aeronautics and Space Administration came into being. But at Lewis and other NASA centers the scientists and engineers barely pause to think about the accomplishments to date. Their work and dreams are on the future and what NASA can accomplish during the next decade and beyond.

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News

NASA LEWIS RESEARCH center

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PHONE - (AREA CODE 216) 433-4000 EXT. 415

FOR RELEASE: MONDAY
SEPTEMBER 30, 1968

Release 68-60

Hugh W. Harris
(res: 932-3966)

CLEVELAND, Ohio, Sept. 30 -- Flight testing of advanced inlets and exhaust nozzles designed for supersonic turbojet engines will begin this week, according to Dr. Abe Silverstein, Director of NASA's Lewis Research Center here.

The series of test flights will be made by Center research pilots in an F-106B supersonic jet aircraft on loan from the U.S. Air Force. Lewis modified the F-106 to accommodate two nacelles housing J-85 engines under its delta shaped wings.

The modifications to the plane are now complete and preliminary flight testing has been conducted to determine any effect of the changes on the plane's flight characteristics.

- more -

During the next 18 months, the nacelles will be used to test six different types of advanced engine exhaust nozzles and two types of inlets. According to Fred A. Wilcox, assistant project manager, "We need to develop a better understanding of the effects of various types of airbreathing engine inlets and nozzles on aircraft performance." The location of the nozzle in respect to the wing, for example, can change the plane's thrust to drag ratio and greatly reduce the efficiency of the propulsion system.

The F-106 was modified to include a digital computer data-recording system capable of recording 480 pressure measurements and 98 other flight characteristics every 11.6 seconds.

The measurements being made during the flights will provide engineers with a picture of air flow around the inlet and nozzles at varying speeds. These findings will be compared with data obtained in Lewis' 8x6 foot wind tunnel.

The purpose of the F-106 flights is primarily to study performance of the nozzles and inlets in the transonic speed range. Smaller versions of all of the exhaust nozzles, as well as the inlets, were tested previously in the wind tunnels at Lewis. In a wind tunnel, however, there is a restriction on how large a component may be tested successfully in the speed range between subsonic and supersonic speeds because of inter-

action between shock waves and the walls of the tunnel.

The initial nozzle tests will be flown from Selfridge Air Force Base in Michigan. In mid-October the plane will return to Lewis adjacent to Cleveland Hopkins International Airport to continue its flights.

Flights will be made over Lake Erie between the Cleveland area and Buffalo, N. Y. En route to Buffalo the plane will fly at subsonic speeds. On the return leg it will fly at supersonic speeds. The F-106B is capable of speeds up to Mach 2, or twice the speed of sound.

Another advantage the aircraft has over wind tunnel tests is that data can be gathered from two nacelles being subjected to exactly the same conditions at the same time. This allows one nacelle to be used as a standard reference while the configuration of nozzles and inlets are changed on the other nacelle.

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News

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PUBLIC INFORMATION OFFICE

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[redacted]

FOR RELEASE: THURSDAY
October 3, 1968

Release 68-61

Hugh W. Harris
(res: 932-3966)

CLEVELAND, Ohio, Oct. 3 -- Nine engineers from NASA's Lewis Research Center here will be honored in New York today for developing two of the "100 most significant new technical products of the year."

Both inventions are in the materials area. One is a refractory fiber-reinforced superalloy that is four times as strong as the strongest conventional superalloy. The other is a ferromagnetic superalloy which maintains its magnetic properties and strength at unusually high temperatures.

The "I-R 100" awards are sponsored by Industrial Research Magazine and presented in observance of National Industrial Research Week. The winning products are selected each year by a special board

- more -

consisting of 30 leading research scientists, engineers and administrators including five Nobel Prize winners. At least one Lewis invention has been honored each year since 1966.

The major constituents of the ferromagnetic superalloy are cobalt, tungsten and iron. The alloy has high strength and good magnetic properties in the 1200 to 1400 degree Fahrenheit temperature range.

The advance in materials technology is important because normally metals lose their magnetic properties as temperature increases. A number of possible future space systems, particularly for electrical power generation will require metals with good magnetic induction and high strength in this temperature range. Here on earth the alloy has potential for use in electric generators and motors.

Reducing weight is a constant goal of aerospace designers. The new Lewis alloy permits generators to operate at higher temperatures which raises the efficiency of the power conversion system. The high temperature strength of the alloy may make possible more compact systems. Taken together these features promise to permit significant weight reductions.

The cobalt-tungsten ferromagnetic alloy was developed in Lewis'

Materials and Structures Division under the direction of John C. Freche, chief of Fatigue and Alloys Research Branch. The development team consists of Richard L. Ashbrook, Gary D. Sandrock, Robert L. Dreshfield and Stanley J. Klima from the Fatigue and Alloys Branch and Anthony C. Hoffman from the Spacecraft Technology Division.

This magnetic superalloy has high temperature rupture strength an order of magnitude greater than the strongest commercial magnetic alloy in use and has comparable magnetic properties.

The refractory fiber-reinforced superalloy was developed by Donald W. Petrasek, materials engineer, and Robert A. Signorelli, head of the Fiber Metallurgy Section under the director of John W. Weeton, Chief of Lewis' Composite Materials Branch.

The alloy is a composite of fine tungsten alloy fiber imbedded in a nickel base superalloy matrix.

The work is an extension of research on composites that has been carried on at Lewis for more than 10 years but is just now becoming economically feasible on a commercial basis. The theory behind fiber composites is that any material is much stronger in fiber form than in bulk form. However, materials in fiber form are also more brittle.

In order to make use of the strength of the fibers, it is necessary to bind a great many of them together in a matrix material. The matrix provides ductility, protection against abrasion and oxidation resistance.

One of the major problems in building a good composite is that reactions can occur between the matrix and fiber which significantly weaken the fiber. A combination of careful matrix alloy composition and advanced fabrication techniques made possible the Lewis superalloy composite.

The Lewis composite is four times as strong as the strongest nickel and cobalt superalloys at 2,000 degrees Fahrenheit. It is twice as strong at high temperatures on a stress/density basis as the best commercial superalloys. This means that the composite has possible application where saving weight is important as well as a higher strength substitute for superalloys.

Possible areas of application for the composite material are in turbine blades and vanes in advanced turbojet engines, and nuclear reactor components such as coolant tubes.

Even more important, the refractory fiber-reinforced superalloy represents a family of materials with a wide range of properties that can be developed in the future.

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FOR RELEASE: IMMEDIATE

Release 68-62

Linda Peterson

CLEVELAND, Ohio, Oct. 1 -- Cost Reduction Achievement Certificates recognizing innovations which significantly reduced costs during fiscal year 1968 were presented recently to 47 employees of NASA's Lewis Research Center by Dr. Abe Silverstein, Director.

At the ceremony employees were commended for their efforts to improve the efficiency and economy of NASA programs. Their "better ideas" meant a savings to the Center of nearly $6.5 million, according to William Beckett, Cost Reduction Officer.

Winners of the Cost Reduction Certificates and their suggestions are as follows:

- more -

AVON LAKE	
Donald E. Schley	Disposition of Government Equipment
BEREA	
David J. Poferl	Simplification of Diaphragm Test-ATS Program
Wilbur J. Taylor	Automation of Refrigeration System, Air Machines, and Water Pumps
BROOKLYN	
Earl T. Bloam	Multiple Coax Cable Splice
Danny Rusyniak	Improved Actuator Mounting for Pressure and Temperature Rake
BRUNSWICK	
Francis R. Kebberly	Cyclotron Main Magnet Current Regulator
Henry C. Donner	Improved Indicator Lights for Use in the Solar Simulator Safety System
CHIPPEWA LAKE	
L. Robert Howe	Recovery of Supplies and Stock
CLEVELAND	
Everett Bailey	Revised Design and In-House Fabrication of Water Flow Venturi Meters for Flow Tests
Frank J. Constantino	Saving Helium Gas Transportation Charges
Edward L. Clark	Automation of Refrigeration System, Air Machines, and Water Pumps
Anthony Gyapjas	Automation of Refrigeration System, Air Machines, and Water Pumps

- more -

CLEVELAND (Continued)

John Kocsis	Automation of Refrigeration System, Air Machines, and Water Pumps
Walter R. Witzke	Revised Method of Machining Molybdenum and Tungsten Tensile Specimens.

CLEVELAND HEIGHTS

G. Paul Richter	Revised Design and In-House Fabrication of Water Flow Venturi Meters for Flow Tests

COLUMBIA STATION

Gordon M. Miller	Automation of Refrigeration System, Air Machines, and Water Pumps

CUYAHOGA FALLS

Martin J. Braun	LH_2 Testing of Centaur Fill and Drain Valves

FAIRVIEW PARK

Virden C. Beckman	Use of Excess Cables for CX 36A and B in Support of Mariner Mars '69 Launches Reassessment of Requirement and Deletion of Four Sandwich Boxes
John H. Norton	Automation of Refrigeration System, Air Machines, and Water Pumps
James N. Tresler	Improved Method for Aeration of Sand in Drop Tower

INDEPENDENCE

Joseph E. Olszko	Elimination of Jettison Spring Mounting Provisions

LAKEWOOD

Milton Lipes	Installation of Vehicle Radio Dispatch System

- more -

MAPLE HEIGHTS

Norman W. Obert	Automation of Refrigeration System, Air Machines, and Water Pumps

MIDDLEBURGH HEIGHTS

Walter Lathem	Technique for Simulating Space-Charge Potential Distributions

NORTH OLMSTED

Thomas P. Cahill	Simplified Centaur Stress Analysis Reports
John C. Estes	Reassessment of Requirement and Deletion of Calibration Matchmate Tests
Armetta Godfroy	Documentation of the Requisitioning and Receipt of Cryogenic Propellants
John L. Kramer	Use of Mid-Course Correction rather than Revision of Guidance Equations Deletion of Photographs Applicable to Centaur Vehicles AC-13, 14 and 15 Reuse of IBM Magnetic Tape
Horace C.Moore, Jr.	Reduction of Procurement Division Subscription Requirements
Kevork K. Nahigyan	Unique Design of Air Heating Equipment
Robert C. Scott	Thermocouple Modification on Isostatic Hot Press
Sanford F. Tingley	Revision of Guidance Equation Requirements
Donald L. Thoennes	Improved Method for Aeration of Sand in Drop Tower

NORTH ROYALTON

Peter A. Halupka	Improved Method for Aeration of Sand in Drop Tower

- more -

OLMSTED FALLS	
Andrew Benko	Automation of Refrigeration System, Air Machines, and Water Pumps
PARMA	
James S. Budimlick	Automation of Refrigeration System, Air Machines, and Water Pumps
Julius E. Trombetto	Redesign of Expansion Joint
George Tulisiak	Brayton Cycle and Sodium Loop Bi-Metal Joints
PARMA HEIGHTS	
Jerome A. Johnson	Use of Excess Cables for CX 36A and B in Support of Mariner Mars '69 Launches
Albert A. Sako	Use of Erasable Sepia Paper
ROCKY RIVER	
Raymond F. Lacovic	Elimination of Thermolag on AC-16 Interstage Adapter
Peter L. Raffo	Revised Method of Machining Molybdenum and Tungsten Tensile Specimens
Joseph A. Ziemianski	Reassessment of Requirement and Deletion of Matchmate Tests Reassessment of Requirement and Deletion of Calibration Tests on Lunar Orbiter
SEVEN HILLS	
Richard Mueller	Prevent Damage to Boroscope Used for Direct Observation of Combustion Burners
WEST RICHFIELD	
Daniel G. Soltis	Use of Less Costly Pressure Relief Valves for Silver Zinc Cells

- more -

WESTLAKE

Robert C. Finke	Automatic Data Taking and Control System for High Voltage Breakdown Studies
Karl F. Reader	Reassessment of Requirement and Deletion of Calibration Tests on Lunar Orbiter

# # #

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PUBLIC INFORMATION OFFICE
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FOR RELEASE: IMMEDIATE

Release 68-63

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, Oct. 4 -- More than 850 senior science students and their teachers from Sandusky area high schools helped NASA celebrate its 10th anniversary this week as they toured the Lewis Research Center's Plum Brook Station.

The National Aeronautics and Space Administration was ten years old on Tuesday, October 1. On that day and the two following days tours were conducted at Plum Brook Station for the visitors from 19 different high schools.

Each year Plum Brook Director Alan D. Johnson extends an invitation to the area high schools to give science students a first hand opportunity to see some of the space and aeronautics research being conducted at Plum Brook.

- more -

This week students visited a number of interesting facilities at the station, including the Nuclear Reactor Facility, the Spacecraft Propulsion Research Facility, and the Space Power Facility.

The 60 million watt nuclear reactor is used to study materials and components for nuclear rocket and power systems. The test reactor allows engineers to study the effect of the radiation environment that a new system will have on its components before it is built.

The Spacecraft Propulsion Research Facility is designed to test space vehicles and upperstage rocket engines in a simulated space environment. The vacuum test chamber can accommodate space vehicles up to 22 feet in diameter and 50 feet long.

The Space Power Facility, presently under construction, will be used to test power generation systems and complete spacecraft. The test chamber, 100 feet in diameter by 122 feet high, will simulate the extreme temperatures and vacuum conditions of a space environment.

During the tour students were accompanied by Lewis staff members who described each facility and answered questions. The students viewed a movie on the Plum Brook Station operations and saw an actual Centaur second stage rocket vehicle. Centaur, developed under the direction of the Lewis Research Center, will be used with an Atlas booster to launch an Orbiting Astronomical Observatory later this fall.

- more -

The successful Atlas-Centaur combination was used to launch seven Surveyor spacecraft to the moon.

Schools which participated in the tours were:

Danbury High School, Danbury
Plymouth High School, Plymouth
Port Clinton High School, Port Clinton
Western Reserve High School, Wakeman
Edison High School, Milan
New London High School, New London
Norwalk High School, Norwalk
Monroeville High School, Monroeville
St. Paul's High School, Norwalk
Vermilion High School, Vermilion
St. Mary's High School, Sandusky
Perkins High School, Perkins
Margaretta High School, Castalia
Huron High School, Huron
Sandusky High School, Sandusky
Attica High School, Attica
Willard High School, Willard
South Central High School, Greenwich
Firelands High School, Kipton

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FOR RELEASE: IMMEDIATE

Release 68-65

Charles E. Kelsey
(res: 234-3034)

1968

SANDUSKY, Ohio, Oct. 11 -- Space age sight-seers once again will have the opportunity to tour the National Aeronautics and Space Administration's Plum Brook Station as it opens its gates on three Sundays this month, October 13, 20 and 27.

The public is invited to take the drive-through tours of the station between 12 noon and 4 p.m. each Sunday. At the main gate each auto will receive a brochure showing the route and describing the research facilities. Each facility is identified to correspond to its picture and description in the booklet.

Among the interesting facilities to be seen during the drive-throughs are the 200-foot tall test stands, the huge Space Power Facility under construction, the 60,000 kilowatt Nuclear Reactor Facility, and many other test sites.

- more -

Visitors will have the chance to view one or more motion pictures at the Engineering Building auditorium. Planned for showing are "The Universe," "Apollo 5 Mission Highlights," and "Returns from Space."

Also in the auditorium will be exhibits of SNAP-8 (System for Nuclear Auxiliary Power) and of an RL-10 engine, the nation's first liquid hydrogen-oxygen rocket engine. People also will see an actual Centaur second stage rocket vehicle. The Lewis Research Center, of which Plum Brook is part, has management responsibility for Centaur. Centaur was used with the Atlas booster to launch seven Surveyor spacecraft to the moon. Now the Atlas-Centaur will be used for a wide variety of missions. Next month it will launch an Orbiting Astronomical Observatory satellite; next spring two Mariner spacecraft to Mars; and it also will be used in the Application Technology Satellite program.

The Plum Brook drive-throughs are held each fall to help accommodate the many individuals and groups who have requested a tour of the Station, according to Alan D. Johnson, Director of Plum Brook. Because of the nature of space research and development projects, only a small number of tours can be scheduled during the rest of the year.

The Station is located just south of Sandusky and west of U.S. Route 250 at the intersection of Columbus and Taylor Roads. Northbound traffic on Route 250 from the Ohio Turnpike Interchange 7 (Sandusky-Norwalk Rd.) should turn west at the first traffic light and follow the NASA signs to the main gate.

No cameras are permitted.

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FOR IMMEDIATE RELEASE

Release 68-66

Marilyn Edwards

1968

CLEVELAND, Ohio, Oct. 15 -- More than $4.4 million in major contracts were awarded during September by the National Aeronautics and Space Administration's Lewis Research Center in support of its space research and development programs.

Contracts of $25,000 or more went to companies in five states. They are listed alphabetically by state and city.

CALIFORNIA:	$4,116,409
Oakland	Alpha Scientific, $26,000, lab power supply.
Redondo Beach	TRW, Inc., $60,984, thermally stable laminating resins.
San Diego	General Dynamics, $4,000,000, Centaur program management and engineering services.
Sunnyvale	Lockheed Aircraft Corp., $29,425, Nimbus D launch vehicle structural dynamic analysis.
MISSOURI:	$135,070
St. Louis	McDonnell Douglas Corp., $135,070, life test of ion thrustor.

- more -

NEW JERSEY:	$30,440
Kenilworth	Valcor Engineering, $30,440, solenoid valves.
OHIO:	$94,155
Cleveland	TRW, Inc., $41,331, development of coatings for chromium alloys. Barry Lawn Sprinkler Service, $26,809, installation of automatic lawn sprinkling system for Space Power Facility at Plum Brook.
Columbus	Battelle Memorial Institute, $26,015, gas pressure bonding of government supplied samples.
WISCONSIN:	$54,694
Milwaukee	Spincraft, Inc., $54,694, parts for the 40-60 inlet assembly.

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FOR RELEASE: IMMEDIATE

Release 68-67

Charles E. Kelsey
(res: 234-3034)

SANDUSKY, Ohio, Oct. 18 -- The second of three auto tours of the National Aeronautics and Space Administration's Plum Brook Station will be held between noon and 4 p. m. this Sunday, October 20.

A brochure showing the route and describing each facility will be distributed at the main gate. This makes it possible for one person in each party to serve as the guide by reading the description of each facility as it is reached.

Visitors will have an opportunity to see a number of interesting space age facilities at the 6,000-acre site. Plum Brook, which is part of NASA's Lewis Research Center, contains a nuclear reactor complex, many rocket system research facilities, a huge Space Power Facility presently under construction, and other test sites. These test stands

- more -

and laboratories are used to conduct research on chemical and nuclear propulsion systems as well as advanced space electric power generation systems.

Visitors may view one or more films -- "The Universe," "Apollo 5 Mission Highlights," and "Returns from Space" -- at the Engineering Building auditorium. There also will be exhibits of the SNAP-8 (System for Nuclear Auxiliary Power) 35-kilowatt power generation systems, and of an RL-10 engine. The RL-10 engine powers the Centaur launch vehicle, which was used for the Surveyor missions to the moon. An actual Centaur, for which Lewis has management responsibility, will be exhibited.

Engineers from Plum Brook's research divisions will be on hand at the auditorium to answer any questions from the public.

The Station is located just south of Sandusky and west of U.S. Route 250 at the intersection of Columbus and Taylor Roads. Northbound traffic on Route 250 from the Ohio Turnpike Interchange 7 (Sandusky-Norwalk Rd.) should turn west at the first traffic light and follow the NASA sign to the main gate.

The final auto tour will be held on October 27 between 12 noon and 4 p.m. No cameras are permitted on the tours.

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FOR RELEASE: IMMEDIATE

Release 68-68

Charles E. Kelsey
(res: 234-3034)

SANDUSKY, Ohio, Oct. 25 -- This Sunday, October 27, will be the public's last chance to visit the National Aeronautics and Space Administration's Plum Brook Station this fall. The Station's main gate will be opened for the drive-through tour between 12 noon and 4 p. m.

At the main gate each auto will receive a brochure showing the route and describing the research facilities. Each facility is identified to correspond to its picture and description in the booklet.

Visitors will be able to see many interesting facilities used to conduct research and tests of advanced space propulsion systems and components. Plum Brook's 60,000 kilowatt Nuclear Reactor Facility, 200-foot tall test stands, the huge Space Power Facility under construction, and other test sites are included on the tour agenda.

- more -

In addition, visitors also enjoy seeing the many deer roaming about the 6,000 acre site. Because they have never been hunted, the deer are very tame and often graze close to the roads.

At the Station's Engineering Building, several films on the space age will be shown. Tourists also will see exhibits of the SNAP-8 (System for Nuclear Auxiliary Power); an RL-10 engine, used to power the Centaur rocket; and an actual Centaur second-stage vehicle. The Lewis Research Center, of which Plum Brook is part, has management responsibility for Centaur.

Engineers from Plum Brook's research divisions will be on hand at the auditorium to answer any questions from the public.

The Station is located just south of Sandusky and west of U.S. Route 250 at the intersection of Columbus and Taylor Roads. Northbound traffic on Route 250 from the Ohio Turnpike Interchange 7 (Sandusky-Norwalk Rd.) should turn west at the first traffic light and follow the NASA sign to the main gate.

No cameras are permitted.

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FOR RELEASE: IMMEDIATE

Release 68-71

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, Oct. 22 -- A class of 34 trades apprentices will graduate this Thursday, October 24, marking the end of a rigorous four-year training program and the beginning of careers as journeymen at NASA's Lewis Research Center.

Lewis' apprenticeship program, the largest among all NASA installations, combines on-the-job training with more than 600 hours of related classroom instruction. The 18th graduation class this Thursday will bring the total to 622 men who have completed their apprenticeship requirements since the program began in 1942.

Eugene J. Manganiello, Deputy Director of Lewis, will preside at the graduation ceremony. J. Creighton Ghrist, Superintendent of Erie-Huron-Ottawa Vocational Education, will speak to the graduates on "Public Service."

- more -

Speaking on behalf of the graduates will be John G. Carpenter, Class President. Carpenter, an Aerospace Laboratory Mechanic, will discuss the importance of teamwork as well as the individual responsibility of each craftsman to perform his job in a superior way.

The ceremony will be highlighted by the awarding of two Certificates of Completion of Apprenticeship to each graduate. William A. Egan, Chairman of the Wage Board and Apprenticeship Training Committee at Lewis, will present the certificates issued jointly by NASA and the U.S. Department of Labor. John F. Kostyo, Executive Secretary of the Ohio State Apprenticeship Council, will present the certificates on behalf of the State of Ohio.

Representing seven different trades, the new journeymen are:

Aerospace Laboratory Mechanics

	Home Address	
Harry R. Byron	R.D. # 2	Wakeman
John G. Carpenter	1638 Diana Drive	Brunswick
Ralph Fallert	10414 Church Drive	Parma Heights
Charles R. Fronzek	11008 Dale Avenue	Cleveland 44111
John P. Greissing	1285 Webb Cliff Dr.	Lakewood
William F. Hanslik	3411 W. 47 Street	Cleveland 44102
Larry A. Jones	3809 W. 152 Street	Cleveland 44111
Gerald L. Loveland	16427 Rock Creek Rd.	Thompson, Ohio
Michael W. Lupton	8988 Priem Road	Strongsville
Donald R. Nealen	3229 Rocky River Dr.	Cleveland 44111
Robert C. Olsey	14022 Hazelmere Ave.	Cleveland 44111
William E. Parkinson	1015 Panna Lane	Cleveland 44109

Aerospace Laboratory Mechanics (continued)

Charles D. Pennington	1240 Seville Ave.	Akron
Dominic J. Ruccella	3310 W. 110 Street	Cleveland 44111
Jack D. Schuerger	422 Pecan Drive	Berea
Richard K. Shaltens	1258 Lakeland Ave.	Lakewood
Kent A. Smith	6824 Orchard Blvd.	Parma Heights
Richard A. Speer	7424 Lewis Road	Olmsted Falls
Russell A. Stevens	Route 4	Medina
R. Christopher Themes	5040 Boston Road	Brunswick
Dennis M. Thompson	1927 E. 41 Street	Lorain
Luequention Wilkins	4101 E. 139 Street	Cleveland 44128
James R. Zelley	17400 Oxford Ave.	Cleveland 44111

Aerospace Service Operators

John T. Kornuc	9934 Pleasant Lake Blvd.	Parma
Richard R. Scheske	2912 Barber Ave.	Cleveland 44113

Experimental Electronic Equipment Mechanics

Gary G. Lesny	525 Abbyshire Drive	Berea
Dale A. Wolfe	210 Mulberry Street	Berea

Experimental Facilities Electricians

John R. Fisher	674 Prospect Street	Berea
Joseph J. Pero	13861 Holland Road	Cleveland 44142
Anthony M. Reddish	3810 Hyde Avenue	Cleveland 44109
Walter F. Schlegelmilch	25151 Brookpark Rd.	North Olmsted

Experimental Metal Modelmaker

Robert S. Dorrance	4226 Charleston Ave.	Lorain

Experimental Metal Worker

Gerald A. Marquis	14686 E. Bagley Rd.	Cleveland 44130

Research Instrumentation Mechanic

James C. Boehlke	4100 Bradley Road	Westlake

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FOR RELEASE: IMMEDIATE

Linda Peterson

CLEVELAND, Ohio, Oct. 25 -- Two employees of the National Aeronautics and Space Administration's Lewis Research Center were honored here today (Oct. 25) for forty years of government service. John H. Collins, Jr., 20639 Erie Road, Rocky River, and Dana W. Lee, 7503 River Road, Olmsted Falls, each received NASA Honorary Service Emblems, recognizing careers of dedication and significant achievements.

Collins, presently a project manager in the Design Criteria Office, Chemical Rockets Division, began his government career in July 1928 at the NASA Langley Research Center in Hampton, Va., as a junior engineer. In 1942 he transferred to Lewis and became Chief of the Engine Research Division. He later became assistant to the Director and was responsible for research coordination with industry and the military services.

- more -

Lee, presently assistant budget officer in the Budget Office, has had a diverse and interesting career. While he was still in high school in 1918 he began his career as a messenger boy with the War Department in Wash., D.C. From there he went to the Bureau of Standards, and later worked with the Topographical Branch of the Geological Survey. He joined NASA's Langley Research Center in Hampton, Va., in July 1929 as a junior engineer and in 1942 transferred to Lewis as project engineer for the Chemistry Building.

In the award ceremonies Eugene J. Manganiello, Deputy Director at Lewis, presented NASA Honorary Service Emblems to 336 other employees marking 20, 25 and 30 years of work with the government. This brings the total number of employees at Lewis who have been in government service for at least 20 years to 1, 150.

Others receiving Service Awards are as follows:

30 YEARS

BAY VILLAGE

Frederick L. Taylor

BEREA

Ralph L. Rosselli

BRUNSWICK

Emilie Mateyka

COLUMBIA STATION

Karl F. Heller

ELYRIA

Willard H. Ordway

MEDINA

Herman J. Thiele

NORTH OLMSTED

Alois Krsek, Jr.
Henry T. Lehr

PARMA

Kenneth E. Jones

STRONGSVILLE

Howard L. Sponseller

STRUTHERS

Charles A. Masters

25 YEARS

AMHERST

Warren L. Marshall

AVON

Robert J. Lalonde
Ralph E. Wienbroer, Jr.

AVON LAKE

Stanley M. Johnsen

BAY VILLAGE

Robert H. Brown
James H. Daus
Richard F. Goodnow, Jr.
Harvey A. Kowatch
William F. Lang, Jr.
Heinz G. Linke
Lawrence R. Madigan
Roland J. Stedronsky

BEREA

Loren W. Acker
Steve P. Barnosky
John Beleny
Leslie H. Curtner
Herman G. Greissing
Stanley J. Jocke
Robert W. Louis
Robert K. Manning
Francis P. Martin
Alfred J. Nachtigall
Walter M. Osborn
William A. Poe
Alex L. Pucci
F. Ralph Schuricht
Melvin T. Werner
Frank R. Williamson
Robert J. Wills

BROOKLYN

Eugene R. Burton
Albert L. Jecko
John D. Merriner
Dorothy R. Takacs

BROOKPARK

James A. Cook

BRUNSWICK

Robert W. Bouman
Ralph L. Schacht

CHAGRIN FALLS

William J. Sedlecky

CLEVELAND

Mary K. Allen	44135
William H. Beckett	44129
Charles J. Bergen	44135
Robert H. Besserer	44102
Donald Bogart	44130
Paul W. Cornean	44135
William T. Crooks	44130
John Czernecki	44130
LeRoy L. Eggert	44135
Mandel Estrin	44121
Mary E. Gorisek	44130
Frank Glowacki	44114
Harold J. Gustin	44144
Walter Griffin	44120
Katherine Howard	44111
Edward G. Hubert	44109
Gisle F. Jacobson	44111
Irving M. Karp	44130
Thadeus J. Knapp	44109
Walter G. Kuhrt	44135
Frank J. Lalli	44142

- more -

25 YEARS

CLEVELAND (continued)

Daniel Meges	44109
Allen J. Metzler	44130
Clyde B. Naylor	44120
Mary L. Potucek	44135
James J. Reagan	44109
Verna Ristoff	44111
Howard H. Roth	44111
Leonard J. Runo	44105
Charles A. Sanders	44111
Harry A. Sebert	44111
Frank M. Simmerly	44111
Paul F. Simpson	44135
Joseph Van Gilder	44135
Sigmund Weintraub	44121
Fred E. Zellner	44130

CLEVELAND HEIGHTS

Alexander Mendelson

COLUMBIA STATION

Donald R. Buchele
William Loebick, Jr.
Russell V. Trende

ELYRIA

Howard T. Calvert
Harold H. Copas
Joseph A. King
John N. Sheehan
Walter C. Sudro

FAIRVIEW PARK

Virden C. Beckman
Dial E. Boehmer
Gilbert R. Delfs
Ralph T. Dittrich

FAIRVIEW PARK (continued)

Ivan B. Ercegovic
Arthur J. Gedeon
Morgan P. Hanson
Walter Herrlich
Jack C. Humphrey
John F. Kline
Joseph F. McGreal
Daniel E. Monroe
Peter Moran
James C. Mungall
Carl V. Niznick
Thaine W. Reynolds
Martin J. Saari
Richard G. Schulke
Fred A. Wilcox

GARFIELD HEIGHTS

Frank J. Schieda

GREENWICH

Lonnie R. Harris

LAKEWOOD

Richard G. Daniels
Angela M. Haferd
Henry R. Hunczak
William C. Kason
John C. Laughlin
James P. Lewis
David D. Schaft
Clifford E. Talcott
Jack M. Wagner

- more -

25 YEARS

LORAIN

Andrew L. Berta
John Csavina
Walter B. Sobotka

MIDDLEBURG HEIGHTS

John Shwetz
Seth B. Wise

NORTH OLMSTED

Michael Barber, Jr.
Michael E. Barrett
Adelbert G. Buchman
Muriel B. Eian
Edward A. Holmok
Joseph J. Hruska
Anthony Jelenich
John H. Lamneck, Jr.
Paul P. Leciejewski
Anthony A. Mastronuzzi
Carl L. Meyer
Bruno A. Pinnow
John H. Povolny
Irene B. Schleicher
Robert C. Scott
Alexander H. Steve
Howard G. Terbeek
Henry B. Wilms

NORTH ROYALTON

Alex Powers
Merlin E. Scharer
Edgar L. Wong

OBERLIN

Fred W. Wiggenton

OLMSTED FALLS

John M. Auerbach
G. Mervin Ault
Francis X. Bechtel
Earl E. Brown
James H. Knapp
Raymond Pilch
Hadley T. Richards
Harry L. Worster

PARMA

William G. Anderson
Robert Brigadoi
Arthur J. Bromeier
Thomas P. Clark
Augustine G. DiNovo
Michael J. Durcansky
Robert J. Gardner
Doris A. Harrington
Herman F. Hertrick
Frank A. Maruna, Jr.
George S. Pablic
Eugene A. Rajecki
William E. Riewaldt, Jr.
Michael C. Schneider
Howard J. Schultheis
Joseph F. Schwarten, Sr.
John R. Seman
Harold J. Starr
John F. Toth

PARMA HEIGHTS

William T. Boulware
Kenneth A. Hoose
Samuel Povraznik

25 YEARS

PORT CLINTON

Richard C. Smith

ROCKY RIVER

Harold H. Christenson
William E. Egan
Chester D. Lanzo
James L. Munro
Michael Mytrysak
William H. Rowe
William H. Swann
Stanley F. Walker

SEVEN HILLS

Joseph P. Cilluffo
Eugene W. Gleisner

SHEFFIELD

Everett F. Stewart

SOLON

James A. Gilbert, Jr.

STRONGSVILLE

Thomas L. Buchar, Jr.
Paul T. Hacker
Milliard E. Hall
Robert Harrison
Frank C. Kocsis
Walter D. Laveen
Harold E. Quay
John A. Severn
Paul F. Wos, Jr.

SOUTH EUCLID

Martin Brown

UNIVERSITY HEIGHTS

Samuel J. Kaufman

VALLEY CITY

Charles W. Ruple

WARRENSVILLE HEIGHTS

George C. Ford

WELLINGTON

Ralph B. Miller

WESTLAKE

Dorothy M. Collins
John R. Esterly
Wilbur A. Forshey
Melvin J. Hartmann
Richard H. Kemp
George L. Mahnke
William C. Morgan
Maurice H. Proskine
Harold J. Schum

- more -

20 YEARS

AVON LAKE

Stanley M. Rea
Robert J. Usher

BAY VILLAGE

Basil P. Kluchnik

BEREA

Edward F. Baehr
William P. Brazis
Howard W. Douglass
Donald J. Exner
James M. Hintz
Rita A. Matis
Shigeo Nakanishi
Oliver W. Reese
John R. Southam
LeRoy T. Ventura
Orlando Vlases
Ida M. Watkins

BRECKSVILLE

Warner B. Kaufman

BROOKLYN

Clayton G. Cookson
Willard R. Moore, Sr.
Samuel J. Szilvasi

BROOKPARK

Robert C. Doerner
Alan L. Saunders

BRUNSWICK

Kefton Donley
Donald T. Goble
Jerry F. Matejka

CLEVELAND

Gilbert M. Boyd	44105
Eugene L. Dietz	44111
Raymond H. Dobshaw	44135
Phillip S. Drossis	44135
Thomas J. Flanagan	44111
Joanne M. Folk	44111
Mary A. Grove	44111
Norman R. Heintz	44135
Rose T. Joyce	44111
Joan L. Lindsay	44111
Henry E. Maslach	44130
Thomas J. Mayher	44109
Charles J. Michaels	44111
Frank L. Nemeth	44135
Robert J. Ocheltree	44112
Edward J. Paulin	44135
Leroy Plank	44131
Edward Popik	44109
Donald H. Priebe	44135
Nicholas M. Ricciardi	44142
Gordon M. Romig	44111
Walter H. Schedley	44142
Henry O. Slone	44130
Stanley H. Smith	44111
William Strasser	44140
Ilio C. Talvacchio	44104
Rose A. Wasson	44128
Ruth N. Weltman	44118
Robert J. Williams	44111
George A. Wise	44135
Wilbur F. Wolfe	44111
Paul H. Zbasnik	44109

- more -

20 YEARS

COLUMBIA STATION

John E. Hickey

EAST CLEVELAND

Harold D. Thomas

ELYRIA

Alfred L. Ritsko
Eldred F Turner

EUCLID

Anne R. Kendra

FAIRVIEW PARK

Donald A. Altmos
John M. Powell

GARFIELD HEIGHTS

Lawrence A. Kocisko

LAKEWOOD

Charles J. Adlard
Irvin O. Borchert
E. Ruth Erickson
Charles A. Wasserbauer
Arthur J. Yurek

LORAIN

Ralph C. Flaczynski
Louis J. Shukait

MEDINA

Elmer J. Petelka

MIDDLEBURG HEIGHTS

Austin C. Herr
Andrew Terpay

NORTH OLMSTED

William J. Anderson
Rodney D. Armstrong
Nick Belovics
William R. Dunbar
Walton L. Howes
John R. Jack
Jack G. McArdle
Horace C. Moore, Jr.
Carl T. Norgren
Howard R. Roe
Rose L. Schalla
Charles L. Sullivan

NORTH RIDGEVILLE

Harry J. Cole

NORTH ROYALTON

Harold S. Dobshaw
Shirley B. Dore
James P. Roberts

OLMSTED FALLS

Anton Constantin
William E. Davies
Melvin H. Jones
Joseph H. Nitchman
George P. Sagaser
John C. Sillasen

20 YEARS

PARMA

Louis P. Bitsko
John Brucchieri
Henry P. Czapor
William A. Funk
Richard E. Glaser, Jr.
William H. Glaser
Marguerite G. Jereb
Martin Kopp
Frank A. Pollak

PARMA HEIGHTS

Mary M. Dominick
Edward J. Kolman
Warner L. Stewart

PORT CLINTON

Robert L. Lemon

SEVEN HILLS

Robert D. Ingebo

SHAKER HEIGHTS

Robert J. Smith
Glenn R. Zellars

SHEFFIELD LAKE

Robert G. Spaulding

STRONGSVILLE

John R. DeLargy
Harry Nicholson
James L. Regner

WESTLAKE

George Foerster, Jr.
Russell A. Lindberg
Howard W. Tschudy
Richard W. Wilson

# # #

News

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FOR RELEASE: IMMEDIATE

Release 68-80

Charles E. Kelsey
(res: 234-3034)

CLEVELAND, Ohio, Dec. 5 -- An artificial heart control system developed at NASA's Lewis Research Center will help medical researchers at the Cleveland Clinic investigate ways a man-made ventricle could assist a damaged natural heart.

Delivered to the Cleveland Clinic last week, the system is the third of its kind designed by Lewis engineers. While incorporating new technology, the system is less complex and less expensive than the earlier models.

The control system was designed by Vernon Gebben and Michael Crosby, and developed by John Webb. Gebben and Webb work in Lewis' Propulsion System Controls Section, Advanced Systems Division, while Crosby is a former Lewis employee now with the General Electric Co.

- more -

In the joint Cleveland Clinic-NASA program, the system will be used to control an artificial heart assist device in research experiments. Later on, however, it can be modified by adding a second output channel to control an artificial replacement heart.

The new system controls the pumping action of an artificial heart electropneumatically. Here is what happens:

-- An electronic R-Wave Detector sorts out the heart beat from the background noise in an electrocardiogram to synchronize the beat of the artificial heart with the natural heart.

-- A programmer containing an adjustable delay receives the synchronization signal from the R-Wave Detector. The signal is delayed for a short time during natural heart stystole (when the heart contracts) or for a longer time during diastole (when the heart relaxes). The programmer also can signal artificial ventricle pumping on alternate heart beats or only on every fourth beat. This would prevent the natural heart from becoming overly dependent on the heart assist device.

-- The delayed signal from the programmer drives a torque motor which converts an electrical signal to a pneumatic signal. Pressure from power supplies is channeled to control the valves of the artificial heart and initiate blood outflow by contracting the heart.

-- A pressure transducer measuring blood pressure and a conductive rubber switch registering blood volume in the artificial ventricle feed back

information to the control system. As a result, the pumping of the artificial heart is automatically adjusted to meet the demands of the body.

The "third generation" control system is less complex than its forerunners primarily because it puts out a square wave of pressure rather than a variable one, as used before. This change, which eliminated additional control equipment,appears adequate for a single ventricle assist device. It may not be justified, however, if the system is used for total heart replacement of both ventricles.

In addition, most of the electronic and pneumatic components of the new system are commercially available. This permits other researchers to easily duplicate the system at nominal cost.

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